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ABSTRACT

This study was conducted to analyze and summarize raw data obtained from a 1972 study: "Report on a Cost Study of Specific Technical Processing Activities of the California State University and College Libraries" with the hypothesis that the cost of technical processes increases as the production volume both rises above and falls below an optimal level. Mathematical, graphic, and statistical tools were used to sort, visualize, and test the data and their relationships. The report records results in the form of graphs, tables, and charts, and discusses results in terms of their usefulness to the libraries supplying data. Emphasis is placed on the nature of time, cost and production measurements, and labor unit cost. No correlation was demonstrated to prove the hypothesis. The study concluded that labor unit cost is significantly complex to reflect more than the relationship between labor cost and production volume. A list of references supplementing the 1972 study is included. An outline of standardized technical processing activities, calculated time percentages for each library, activity flowcharts, data tables, graphs, and charts are appended. (Author/KP)

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ANALYSIS OF THE DATA FROM A TECHNICAL PROCESSING COST STUDY

BEST COPY AVAILABLE

A Research Paper

Presented to

The Faculty of the Graduate School of Librarianship

California State University, San Jose

In Partial Fulfillment

of the Requirements for the Degree

Master of Librarianship

by

Hans Joachim Rocke

June, 1974

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Chapter 1

INTRODUCTION

In preparation for possible future automation the technical processing functions of the libraries on the nineteen campuses of the California State University and Colleges have been studied to describe the manual operations of each department. In the spring of 1972 a plan was implemented to gather time, volume, and cost figures for specific standard technical processes in the areas of acquisitions, cataloging, and administration of these operations. Under the direction of a project team a coordinator in each library was instructed in the methodology and use of forms for this project and the procedures were tried for the period of one week. During another twelve-week period the data were collected and the figures gathered in the last ten-week span from March 6 to May 12, 1972 were actually used for the published report entitled: REPORT ON A COST STUDY OF SPECIFIC TECHNICAL PROCESSING ACTIVITIES OF THE CALIFORNIA STATE UNIVERSITY AND COLLEGE LIBRARIES (hereinafter referred to as the REPORT).

Statement of the Problem

It was the intention of the Project Team for the Technical Processing Cost Study (TPCS) to issue its report in two parts, 1) the computer-produced summary data and 2) a detailed analysis of the findings. However, the second part of the report has not been produced to date.

The purpose of the TPCS is stated thusly:

> . . . to provide CSUC librarians with accurate cost figures for their own operations as well as a means of comparing costs based on a standardized methodology, . . . to facilitate comparisons among similar functions in several libraries as well as between current manual operations . . . .

The first part of the report was disseminated as rapidly as possible among the librarians of the nineteen libraries in order to accomplish the first of the purposes stated above. There seems to have been little feed-back from the librarians or management to indicate for what purposes or which portions of the TPCS report have been used. Especially for the administrator a compilation of raw, unevaluated data is cumbersome to use, has little informative value, and presents no material with meaningful comparability.

Need for the Analysis

At a time when the scientific approach to the solution of problems within the field of librarianship is furthered by the analytical examination of its components preparatory to a decision on automation and computer application, the statistical evidence to represent the status quo in library operations is very desirable. But this is just the initial phase of a series of steps toward a composite and total description. The next phase consists of preparing and modifying the initial data to conform to a context in which it will become meaningful and useful information.

To do this the nature of the data has to be determined, the figures and facts need to be placed in a meaningful order whereby their relationships and similarities become apparent. By calculating proportions,

percentages, and differences the relative value of the data can be tabulated or graphically represented.

Limitations

This research and analysis is concentrating on the utilization of the unevaluated data contained in the REPORT. The investigation will be restricted to the conditions, methods, and results recorded in the above source and as they apply to the nineteen libraries. No attempt will be made to identify the individual libraries by name; they will remain coded by letter to retain objectivity and any conclusions will be based on the evidence recorded in the source, i. e. the REPORT.

The limitation of the literature search is similarly dictated by the extent of the work already done in preparation for the REPORT; thus the emphasis will be placed on sources contributing to a clearer insight into the analysis of library data, standards, time, and cost. An extension of this search toward literature on optimization has led to references on models, primarily mathematical, of specific library operations and systems. No attempt will be made to deal with the principles of acquisition and cataloging or to justify the choices of functions and activities for each operation as used by the TPCS team.

Hypothesis

The original intention of this project is the analyzing and summarizing of the raw data published in the REPORT. But in the process of this analysis there will be a constant alertness for trends and indications which could have meaningful application when related to, say, unit cost and production volume, or collection, or staff. Mathematically speaking, unit cost is just the quotient of cost and volume and does not

offer much promise as an indicator of other factors which might interest the supervisor, especially when cost is actually fixed cost, i. e. salaries. But to discover if in fact, there are other forces at play shall be the challenge posed to this project.

The search for factors affecting cost and the discovery of an optimal production size shall be expressed by the following hypothesis:

> The cost of technical processes increases as the production volume both rises above and falls below an optimal level.

A cost survey by MacQuarrie[1] supports the supposition that the cost of library operations, particularly technical processes, is dependent on the size of the collection. Her study was concerned with public libraries and it remains to be seen if a similar trend is detectable in academic libraries, or if, indeed, the data contained in the REPORT are even suitable to reflect this phenomenon.

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[1]Catherine MacQuarrie, "Cost Survey: Cost of Ordering, Cataloguing, and Preparations in Southern California Libraries", Library Resources and Technical Services, 6:337-56, April, 1962.

Chapter 2

PLAN FOR THE ANALYSIS

Literature Survey

Publications on technical processing cost studies in libraries are not found under any one particular heading but are rather diffuse. Cost studies extend in scope from accounting to building block cost analysis and PPBS. Cost, particularly unit cost, is considered in relation to what is costed, the method of study, and the measurement used to arrive at the unit. To make cost study results meaningful not only to the one conducting that particular study but to others searching for comparable measurements an agreement on terms and methodology must exist, i. e. standardization. Viewing these studies, their results and figures from the standpoint of managerial decision making, the analysis, interpretation and statistical evaluation for projection and prediction requires yet another approach to the search for literature on this topic.

To aid in the search for literature published in the fields of technical processes for college libraries, Dougherty's bibliography of published cost studies[1] and an off-line bibliographic citation list generated by ERIC/ORRIT[2] on library technical processing cost studies

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[1] Richard M. Dougherty and Lawrence E. Leonard, Management and Costs of Technical Processes: A Bibliographical Review: 1876-1969, (Metuchen, New Jersey: Scarcrow Press, 1970).

[2] Library Technical Processing Cost Study, "Bibliographic Citation List Generated by ERIC/ORBIT," (Santa Monica, California: System Development Corporation, November 26, 1973).

were consulted most frequently. Of help were also the selected bibliographies by Reynolds[3] and Tesovnik[4]. To provide an authoritative representation of literature and state-of-the-art on studies in library operations and services, Wessel[5] appears most frequently cited.

The search was limited to publications, preferably published within the last ten years, which provided background information on the three main areas of interest:

1) Cost Analysis
2) Standardization
3) Optimization

Cost Analysis

The first mention of cost accounting in library literature is found in the first volume of Library Journal. Charles Cutter in 1876 there proposes this method to librarians. Fremont Rider[6] introduces cost accounting by dispelling some prevalent misconceptions. He suspects that most librarians are not concerned with cost since their library is a non-profit organization; he also points out that merely keeping a tally or so-called statistics is not to be equated with accounting, a

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[3]Rose Reynolds, Compiler, "A Selective Bibliography on Measurement in Library and Information Services," (Aslib London, England: April, 1970).

[4]Mary Tesovnik and Florence E. De Hart, "Unpublished Studies of Technical Service Time and Costs: A Selected Bibliography," Library Resources and Technical Services, 14:1:56-57, Winter, 1970.

[5]C. J. Wessel and B. A. Cohrssen, "Criteria for Evaluating the Effectiveness of Library Operations and Services, Phase I. Literature Search and State-of-the-Art," (Washington, D. C.,: John J. Thompson Co., February, 1967), AD 649468; Phase II, AD 026105, August, 1968.

[6]Fremont Rider, "Library Cost Accounting," Library Quarterly, 6:4:331-381, October, 1936.

task dreaded by librarians then as now. Rider also does not condone the excuse that numerical operations beyond a certain degree of complexity will not be performed by the librarian. He hopes that in libraries unlike in most businesses the person responsible for the accounting is less tempted to falsify the records. The final misconception Rider hopes to remove is that the keeping of an additional record is an unjustifiable expense.

Palmer[7] rightfully criticizes the figures collected by most libraries as lacking in significance and interpretation to reach defensible conclusions. Before any data are gathered it should be clearly determined of what these should consist, how they are to be obtained, and for what purpose. They must allow for comparison from year to year, expert advice ought to be employed to select the best sampling techniques and finally the reporting to federal and state agencies should not take precedence over the statistical analysis useful to the library itself.

Smith and Schofield[8], but also Price[9], Mlynaczyk[10], Vickery[11], and Robertson, et. al.[12] explore the parameters of costing in order to

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[7]David Palmer, "Measuring Library Output," ED 045118, 1968.

[8]G. C. K. Smith and J. L. Schofield, "Administrative Effectiveness: Times and Cost of Library Operations," Journal of Librarianship, 3:4:245-266, October, 1971.

[9]Douglas S. Price, "Real Costs for Information Managers," ED 061969, 1972.

[10]Frank Mlynarczyk, Jr., "Measuring Library Costs," ED 045120, 1968.

[11]B. C. Vickery, "Research by Aslib into Costing of Information Services," Aslib Proceedings, 24:6:337-341, June, 1972.

[12]S. E. Robertson and A. P. Wilkin, "Standard Costing for Information Systems: Background to a Current Study," Aslib Proceedings, 22:9:452-57, September, 1970.

determine the necessary and significant factors to render a true picture of library operating expenses. Before the cost is computed the product, be it an item or a task, must be defined and isolated. To cost a task the process should involve only one person; the variables affecting the time required for the operation, a clear start and finish of the task, and a specific end product must be identified.

Another question which must be answered before determining cost, is "How much is to be included?" Just the time spent on the job? The material? The equipment? The facilities? The utilities? True cost is total cost and the product cost should reflect all of these and any other expenses incurred. Vickery also examines the characteristics of five different techniques of obtaining labor cost:

1) Consulting the existing work record, e. g. titles or volumes cataloged.
2) Interviewing the person (recommended where the individual performs well-defined tasks).
3) Work diary--provides a continuous record but adds to the work load.
4) Activity sampling.
5) Time study--best for short-cycle manual or clerical tasks.

Cook[13] extends cost accounting to cost recovery, a desirable and logical sequel which certainly deserves consideration in any organization, profit or non-profit. In a recent article Price[14] explains his Building Block Costing technique and emphasizes the importance of conducting work sampling under normal operating conditions, allowing

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[13] J. Cook, "Financing a Library/Information Service by Operating a Cost Recovery System," Aslib Proceedings, 24:6:342-49, June, 1972.

[14] Douglas S. Price, "Rational Cost Information: Necessary and Obtainable," Special Libraries, 65:2:49-57, February, 1974.

sufficient time and detail to provide statistically analyzable data and permitting cost relation to production as a result of expenditure by observing the duration of the production cycle.

Standardization

For unit cost to become a valid indicator of performance and cost of an information system it must include all the costs of the system and the unit itself must be a valid measure of the activity, i.e. countable, verifiable, and documented. To arrive at results of comparability the work of Voos[15], Bourne and Kasson[16], and Dougherty[17] to establish standards is fundamental. Establishing standard times and cost data for technical processing activities still requires precision in clarifying what they represent and under what conditions they apply. Hamburg[18] points out some weaknesses that are found in most standards. He contends that they usually are descriptive in nature and therefore make evaluation extremely difficult. Those which prescribe quantitative objectives usually have

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[15]Henry Voos, "Standard Times for Certain Clerical Activities in Technical Processing," Library Resources and Technical Services, 10:2:223-27, 1966.

[16]Charles P. Bourne and Madeleine S. Kasson, "Preliminary Report on the Review and Development of Standard Cost Data for Selected Library Technical Processing Functions," Prepared for Council on Library Resources, (Washington, D. C., 1969).

[17]Richard M. Dougherty, "Cost Analysis Studies in Libraries: Is there a Basis for Comparison?" Library Resources and Technical Services, 13:1:136-141, 1969.

[18]Morris Hamburg, Leonard E. Ramist, and Michael Bonmer, "Library Objectives and Performance Measures and Their Use in Decision Making," Library Quarterly, 42:1:125, 1972.

been arbitrarily formulated by value judgments. Standards should evaluate the difference between the output and the input, rather than just the differences of the input resources of libraries. Finally, standards seem to discourage experimentation with different programs and allocations of input resources designed to meet the needs of the library's particular population. He concludes that merely meeting the standards implies perhaps falsely that the library is doing an adequate job. A succinct summary and checklist on standard procedures for standardization is found in an article by Wilkin[19].

Optimization

Relatively few authors have proceeded to bring cost studies and their analyses to bear upon library operations, staff distribution, staff size, collection size or rate of acquisition. From Downs[20] and Smith[21] we obtain a collection of figures which may prove helpful in assessing a library's standing in relation to others, but most all of the indicators emphasize quantities and relationships which allow little or no insight into the dynamics of the library from an operational or systems approach. Tesovnik[22] brings cost studies of different libraries together but of the eight colleges and university libraries reported

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[19] A. P. Wilkin, R. Reynolds, and S. E. Robertson, "Standard Times for Information Systems: A Method for Data Collection and Analysis," Journal of Documentation, 28:2:131-150, July, 1972.

[20] Robert B. Downs, University Library Statistics, (Washington, D. C.: Association of Research Libraries, 1970).

[21] Stanley Smith and Joel Williams, "Library Statistics of Colleges and Universities: Institutional Data, Part B," Fall, 1971; Basic Information on Collections, Staff, and Expenditures," 1971, ED 065136, Part A, ED 061996.

[22] Tesovnik, op. cit.

only two happen to give unit cost figures of the same activity (i.e. card production) and even then only with scanty specifications.

"It has often been stated that the cost of cataloging increases more than proportionately with the size of the book collection."[23] This statement by Dean some 28 years ago is indicative of the use to which the accummulated information on costs of library operations may be put. MacQuarrie[24] in 1962 published a study comparing unit costs of cataloging in different size public libraries. She grouped them under four categories by collection size. Unit time of cataloging followed this ranked arrangement in direct correlation, but a comparison with unit cost, however, did not display this direct relationship:

50,000 - 75,000	14-19 min	$1.03-1.33
100,000	23-28 min	$0.76-1.00
150,000-400,000	30-60 min	$2.00
400,000 plus	80-120 min	$4.00

"When using the cost per title based on professional salaries of catalogers divided by number of titles cataloged, the range had a definite correlation with the size of the collection, with the cost range divided into four groups."[25] Factors responsible for this correlation are presumed to be the more exact cataloging that is needed as the collection increases in size, depth, and spread.

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[23] Hazel Dean, "Size of Cataloging Staffs in Academic Libraries," College Research Libraries, 7:1:52-57, January, 1946.

[24] Catherine MacQuarrie, "Cost Survey: Cost of Ordering, Cataloguing and Preparations in Southern California Libraries," Library Resources and Technical Services, 6:4:337-350, 1962.

[25] Ibid.

In an analysis of cost accounting for a large university library Leimkuhler[26] reports very objectively that branch libraries with a circulation in the range of 50,000 to 70,000 are found to have the minimum cost per unit of circulation. At this point he makes no attempt to explain this phenomenon. Dougherty,[27] Heinritz,[28] and Taylor[29] deal with applications of statistical findings to over-all management, technical services, personnel allocation, and operations research, respectively. Finally, Kochen and Deutsch[30] and Raffel and Shishko[31] cope with the pros and cons of centralization vs. decentralization. Kochen and Deutsch project the increasing economy and necessity for decentralization by means of a mathematical model, broad enough in application and interpretation to apply to any organization or operation, political, economic, educational, or whatever. Their conclusion is that although at present the trend toward centralization is most prevalent, due to increased

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[26] Ferdinand F. Leimkuhler and Michael D. Cooper, "Cost Accounting and Analysis for University Libraries," College and Research Libraries, 32:6:449-464, November, 1971.

[27] Richard M. Dougherty and Fred J. Heinritz, Scientific Management of Library Operations, (New York: Scarecrow Press, 1966).

[28] Fred J. Heinritz, "Optimum Allocation of Technical Services Personnel," Library Resources and Technical Services, 13:1:99-101, Winter, 1969.

[29] David W. Taylor, et. al., "An Operations Research Study of the Pacific Northwest Bibliographic Center: Final Report," ED 065127, June,1972.

[30] M. Kochen and K. W. Deutsch, "Toward a Rational Theory of Decentralization: Some Implications of a Mathematical Approach," American Political Science Review, 63:3:734-749, September, 1969.

[31] J. A. Raffel and R. Shishko, "Centralization vs. Decentralization: A Location Analysis Approach for Librarians," Special Libraries, 63:3:135-143, March, 1972.

necessity for precision and adaptability of responses within the systems of communication the future will favor decentralization.

The material collected in this survey shows a dense distribution of work done at the elementary levels of research. From the plethora of basic studies the critical and analytical process progressively decimates the contributions until barely a handful deal with what might be considered the frontier of investigation. Particularly the studies by MacQuarrie and Leimkuhler are of the nature and quality that proves to be most suitable to support this study. The field, obviously, is relatively unexplored and much work is still needed.

Methodology

It is necessary to preface a discussion of the methodology followed in this project with a description of the nature and origin of the data as recorded in the REPORT and how they were manipulated in order to provide a clearer understanding of their significance and quality. Strictly speaking, the raw data were contained in the several Function Worksheets prepared by the nineteen libraries and not in the REPORT. These data, gathered over a ten-week period were then combined, processed, and reported in a condensed format.

In the REPORT, Section I gives a verbal account of the background, methodology, and history of similar studies; a description of the implementation, findings, the format, symbols, and corrections of some data. Section II contains four summary sheets:

1. A Summary of total cost and percentages for
   a) Ordering (with unit cost)
   b) Cataloging (with unit cost)
   c) Processing (with unit cost)
   d) Related Acts
   e) Total

2. A Summary of Unit Costs listing eleven categories of functions for which volume figures were available.

3. A Bibliographic Search Summary showing the total cost and hours for
   a) General Search
   b) NUC Search
   c) MCRS
   d) CARDSET
   e) Total

4. A Summary of Production Units showing eleven columns pertaining to the four main phases of the total technical process:
   A. Ordering
      a) Process requests
      b) Titles ordered
   B. Receiving
      a) Titles received
      b) Volumes received
   C. Cataloging
      a) Volumes/copies added
      b) LC Cataloging
      c) Original Cataloging
   D. Typing, finishing, and binding
      a) Card set production
      b) Volumes processed
      c) Volumes mended
      d) Volumes bound

On each summary the high (H), low (L), and median (*) value is indicated. Then follows a detailed time and cost computer print-out for each library of each activity, subtotaled for each function and operation, and totaled. These figures are segregated by category of employment status, i.e. professional, library assistant, clerical, and student assistant.

Section III contains the documents, forms, and instructions.

Appendix A enumerates the standardized technical processing activities, identifies and defines them.[32]

Appendix B gives examples of the instructions which accompany the Function Worksheets.

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[32]See Appendix A of this paper.

Appendix C lists the instructions for completing the Production Unit Summary Report.

Appendix D shows the activities used in summation to arrive at the summary totals and unit costs.[33]

Appendix E compiles the Function Worksheets bearing the listed activities of the total survey.

Appendix F is a copy of the Production Unit Summary.

The REPORT contains three types of data; the first type is time values reported in quarter-hour segments per eight hour day by each person performing any of the activities. The second type is production units as reported and recorded for the various units and sections of each library. The third type is monthly salaries and hourly wages for each class and level of individual involved in any of the activities previously mentioned.

The main body of Section II contains a combination of data of the first and third types from which most of the information will be drawn to be used in this evaluation. Beyond the processing which has already occurred with the raw data, the figures and information contained in the REPORT are subjected to three operations:

1. Sorting Operations
2. Mathematical Operations
3. Graphic Operations

These three processes of analysis may not differ too significantly from each other because there may be features in one which another may also

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[33] See Appendix A of this paper.

express, except via a different channel, e. g. mathematical and graphic operations deal with the same information, except one numerically and the other graphically. The division is made mainly to mark progressive stages of analysis.

During the Sorting Operation like activities, functions, and operations are juxtaposed to discover relationships which initially may not be discerned from the format and manner in which the data are originally presented. Tracing the rationale, relatedness, and progression of technical processes, singly or in groups, helps clarify the effects, influences and dependencies among them short of actually constructing a theoretical model of parts or of the entire operation.

At this point of the analysis the process is highly exploratory, experimental, and designed to lead to discover meaningful relationships. Using the construction of charts, e. g. listing activities against libraries, libraries against personnel, or personnel against activities, facilitates comparisons and the determination of similarities and dissimilarities.

Another method employed in the sorting operation is the rearrangement of certain sequences by various determinants or ranking, such as the magnitude of production volume; i. e. libraries are arranged by increasing or decreasing order of production volume, unit cost, or cost. In this manner trends of correlation can be detected, if at all present, when other data are listed in conjunction.

Arranging data, not necessarily in exact order of magnitude for a certain facet, but allowing more latitude of variation without losing the ability to discover trends, can be accomplished by grouping.

Thus the factor of total cost of a technical operation for each library may be used to determine the assignment of that library to one of several groups predetermined by natural or obvious division; e. g. high, medium, and low. Then if the individual figures of another aspect to be examined do not display as obvious a trend as might be desirable, averaging these values for each group will centralize the tendency for each section and thus magnify their differences.

Mathematical operations are the second method of analysis employed for this project. They are essentially limited to the computation of percentages and averages to explore the proportions, relative values, and similarities of the available data.

Although computing percentages is not a very complicated task it constitutes the most prevalent one for this project (almost 1400 operations). For each library the percentage of time is computed which professionals, library assistants, clerks, and student assistants contribute to the performance of every function.

In some instances accuracy of these percentages will suffer from unreliable reporting but the frequency of this happening is extremely low. The significance of these percentages is expected to become more apparent as the cost with respect to personnel is examined.

In the Graphic Operations an attempt is made to make numerical relationships more apparent. For this purpose histograms are used; changes of one factor when the other is held constant, normalized, or is arranged in a specific order can be shown in curves or graphs. To aid the visualization of tasks performed or omitted by individual libraries the libraries are entered on a chart along with all the

features to be compared and by quickly discernible symbols the presence or absence of an activity can be determined. Those activities which display sufficient continuity and interrelationship can be recorded in flow charts to indicate the course of technical processes studied in the nineteen libraries.

Terminology

A detailed description of the functions and their scope as used in the TPCS is included in Appendix A together with the derivations of summary and unit costs. Unless explained in the text, the use of terms and their definition are given in this section.

Activity - as used in the TPCS, work done by the individual at the level of the smallest significant performance unit (prefaced by arabic numerals in work chart).

Building Block Costing - a method of costing suggested by Douglas S. Price, whereby a total system is divided into subsystems which are small enough to yield a discrete, measurable unit of work or service. Thus equitable allocations can be made to compute total unit cost.

Cost - the value of products or services expressed in monetary units (dollars).

Cost-benefit - assessment of the value of service rendered to a patron or receiver.

Cost-effectiveness - a measure of the extent to which the objective has been reached.

Costing techniques - methods by which information on time, labor, products, or services are obtained, such as:

Interviews - the person performing the activity is queried directly and reports from memory on time, labor, productivity, and working conditions.

Sampling - information on products or services and time is obtained by another person without interrupting the work process.

Stop-watch technique - another person times the completion of work units or services without interrupting the work process.

Gross unit cost - cumulated service or product records are used on which to base unit values for time or cost.

Batch technique - timing of a known amount of like, repetitive or related tasks.

Diary technique - the worker keeps a continuous record on products or services per time period.

Existing records technique - see Gross Unit Cost.

Function - as used in the TPCS, the work executed by divisions of the departments; e. g. ordering, precataloging, filing (prefaced by capital letters in work chart).

F-Variable - A random variable formed from the ratio of two independent chi-square variables, each divided by its degrees of freedom, which follows the rule for the F distribution. It is a non-negative, real number.[34]

Operation - as used in the TPCS, the work performed by a department, such as acquisition, cataloging, or administration (prefaced by roman numeral in work chart).

PPBS - Planning-Programming-Budgeting-System. A system of costing by objectives with built-in feedback via cost-effectiveness and cost-benefit.

Work chart - a listing of the work covered by the TPCS arranged by operation, function, and activity.

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[34] William L. Hays, Statistics, (San Francisco: Holt, Rinehart, and Winston, 1963), p. 349.

Chapter 3

RESULTS OF THE ANALYSIS

The results of this analysis are reported under three main categories: 1) an examination of the nature of the data to be analyzed, 2) the graphic and simple arithmetic processing of the data, and 3) computer-produced statistical analyses. Only those records pertinent to and illustrating the reporting are included in this chapter while all other documentation is found in the appendix.

Nature of the Data

The initial step in analyzing the data given in the REPORT is to determine and examine the nature, potential, and limitations of the figures and values. They are grouped by: a) time measurements, b) dollar amounts, c) production volume, and d) unit cost.

Much can be gathered about the nature of data from the way in which they are collected; the time values for each of the activities are already a compilation of separate times spent on a particular job by more than one individual. Time measurements were made by the individual who submitted them on a daily work sheet and they contained only time spent productively. Accuracy is to the nearest quarter hour and for some short-duration, repetitive tasks this may not permit a large degree of accuracy. E. g., Library "A" received 71,138 titles during the ten-week observation period; the total time for all personnel involved to process these many

titles in the "Receive" function was 1,602.50 hours or 0.0225 hours per title. Any fraction of a quarter of an hour not reported could account for as many as ten extra titles, multiplied by the number of perso... involved in just that one function.

Reporting time that is actually expended while productively engaged will assure accurate cost of production labor in later evaluations; but technical processes, and, for that matter, any aspect of library work is not performed continuously with peak effort. Based on other studies a factor of up to 35 percent[1] idle time may be included to arrive at a balance between an employee's productive time and actual time spent on the job. This does not apply to personnel in supervisory or administrative positions where work output is not a discrete, measurable entity.

The diary method of collecting data for time spent on a specific activity is most reliable when the work is varied and each activity occupies more than the smallest recorded time unit. If this is not the case, the error is only compounded in further calculations. When the activity is standardized it would appear that time is the most universal unit in which to express work performance, provided there is an indicator of the level or step (professional, non-professional) for the individual and his proportional involvement.

Time may also be considered within the context of a scalar quantity. The time measurements of this study were taken, first as an

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[1] David W. Taylor, et. al., "An Operations Research Study of the Pacific Northwest Bibliographic Center: Final Report," ED 065127, June, 1972, p. 37.

indicator of work performance, but second, the measurements were taken over a period of time; i. e. the ten-week period of observation. This second time dimension becomes of interest and significance as it reflects cyclic or seasonal occurrences (especially when the study is conducted over a period of a year or more). The REPORT did not contain values along this dimension.

Any cost study needs to define its parameters and for this one the parameters of costing are limited to personnel cost only. This definition must be clearly stated to avoid any misunderstanding or misinterpretation. For each library the same salary and wage scale applies and the dollar amount reported for each activity, in turn, is a composite of the various pay rates applicable to the individual staff member or members involved. E. g., activity No. 42, "Searching" is performed by all four categories of employees. Of the total expenditure on salaries ($1,077) for 293.25 hours of searching, $242 is allocated to professionals, $682 to library assistants, $143 to clerks, and $10 to student assistants. The professional rate of pay averages out to $4.30 per hour but is actually a composite of, say, two assistant librarians and one associate librarian, each earning a different salary.

Since the rate of hourly pay does not vary from one library to another these dollar figures do provide a valid basis for comparing the extent of manpower invested in the various activities, functions, and operations. Broken down by status (professional, library assistant, clerical, or student assistant) the dollar figures also indicate what emphasis each library places on the use of professional and non-professional personnel in the performance of the various activities.

For a compilation of average dollar amounts per hour for the four employment categories and the nineteen libraries the reader is referred to Table 1 in the appendix. Hourly pay is computed from the total number of hours and the total amount of dollars each library expended in each employment category for all operations. The following table summarizes the high, low, median, and standard deviation within each of the four categories.

	Prof. $/hr.	L. A. $/hr.	Clerk $/hr.	Student $/hr.
High	P 5.76	H 4.19	H 3.09	M 2.08
Low	I 4.64	C 3.20	C,I 2.82	D 1.24
Median	5.24	3.81	2.94	1.85
Standard Deviation	0.2147	0.1337	0.0689	0.1158

Obviously, the cost of technical processing output is not composed of salaries and wages alone; there are material costs, equipment costs, maintenance costs, utility costs, overhead costs, etc. These would all have to be included in the overall cost picture to give a realistic representation of the operational expenses. It must be recognized that a study in such depth was beyond the scope of the Technical Processes Cost Study, but the data covering these aspects must be available to the systems designer.

Production volume or units were reported weekly by the local coordinator. The summary of production units in the REPORT lists eleven different categories. Under the Order operation there are two: 1) Book order requests processed and 2) Titles ordered. The Catalog operation contains three: 1) Volumes added, 2) Titles cataloged with LC copy, titles analyzed, recataloged, reclassified, and 3) Titles cataloged

without LC copy, titles recataloged, reclassified. Processing includes two: 1) Card sets produced, not purchased, 2) Volumes processed. The remaining four columns are not placed under any particular heading; they comprise: 1) Titles received, 2) Volumes received, 3) Volumes bound, and 4) Volumes mended. For a complete analysis, three more columns were added:

1) Total production units under Order (Requests processed plus Titles ordered)[2]

2) Total of production units under Cataloging (Added Volumes/ Added Copies plus Volumes Cataloged with LC copy plus Volumes of original cataloging).

3) Total of Processing (number of card sets produced plus number of volumes processed).

The nature of production units is significant both from the study design and the analysis view point. When dealing with a variety of libraries it is entirely possible that the concept of the production unit, although delimited in the operational procedures, may still vary in quality, i.e. the parts that make up the final product (See Table 2, Activities Omitted). E. g., the extent to which a request is processed may be different in each library, some performing every one of the three separate steps within the activity of reviewing book order requests; others may check the request for completeness and suitability and send it on; while still others may just check the bibliographic information

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[2] Number of titles and Volumes have been omitted to parallel the constituents of unit cost for the Order function.

without checking the status of the funds. A more lucid illustration may be that of end processing: not every library affixes biographical and review materials in the books, practices of covering the books with plastic jackets varies from library to library; some use book pockets, others have date due slips; the technique of labeling the call number on the spine certainly is not standardized. Thus the production unit is not as standard a unit as might be desirable and this must be recognized when reading this or any other cost study.

The subject of unit cost can be considered a summary of all previously mentioned data since unit cost is affected by each one. It may be labor unit cost (as in the REPORT), or it may range all the way to total unit cost, at which point it does contain all possible costs and expenses incurred by that particular job or task.

At first glance unit cost may appear as nothing more than a simple quotient of dollar amounts and production volume which, mathematically speaking it is, indeed. But dollar amounts, as has been pointed out, are a composite of training level and expertise, complexity of machinery, equipment, and, perhaps, computer hardware and software. Unit cost also reflects skill and experience, dexterity, and general work performance as part of the production volume factor.

The REPORT has limited its unit cost to strict labor unit cost but even at this point the factors affecting this entity have not been consistently reported or accounted for. Any one of the participating libraries is certainly aware of the points wherein their operational mode deviated from the standard and specific technical processes activities laid down in the Technical Processes Cost Study and the reasons

for marked differences from mean values reported in the study would most likely be due either to such deviations or abnormal work performance by the personnel.

The nature of unit cost is such that it does not permit the summation of cost and production units to arrive at a combined unit cost.[3] The addition of unit costs must comply with the mathematical rules governing the addition or subtraction of fractions. E. g.:

	Cost	Units	Unit Cost
Process Requests	$2,720	9,327	0.29$/unit
Titles Ordered	2,750	6,726	0.41$/unit
Total order	$5,470	16,053	0.70$/unit

but NOT $\frac{\$2,720 \text{ plus } \$2,750}{9,327 \text{ plus } 6,726}$ equals 0.34$/unit

A final comment about unit cost concerns the degree of accuracy. Since the value of unit cost is going to be used to compute cost estimates when the production units are projected, or when a projected cost figure is to yield the estimated production volume, maybe for the next fiscal year, the degree of accuracy of the unit cost figure must at least equal that of the cost figure or the production units. A five digit number, either dollar amount or production units, must produce a unit cost value with five significant digits. Using Library "H" as an example, the unit cost is reported as 0.23$/unit. Given a total cost of $4,333 the estimate

[3] It is due to this error that the figures for unit cost listed under Cataloging in the Summary of the REPORT, p. 1, are not correct.

of production units with the aid of the unit cost figure equals 18,839 units. Had the division of units into cost been carried out to five digits to match the five digits of the production unit figure, the unit cost figure would read 0.23257$/unit and a unit estimate with this unit cost value would amount to 18,631, as actually reported, thus avoiding the 208 unit error.

Tables and Charts

The following section contains the findings from the arithmetic computations, the graphs and charts. The computations were to obtain percentages of involvement of each of the four classes of library staff in each of the fourteen functions and sum totals of each of the three operations. The operation "Administration" has not been included as material for the analysis since their activities definitions were ambiguous (REPORT, p. 6).

For the percentages of staff involvement the time (in hours) was chosen rather than the cost figure since the latter carries a weight factor in the form of salaries or wages subject to personnel assignment and fluctuations due to inflation and adjustments.

$$\text{Staff Percentage} = \frac{\text{Time spent on function}}{\text{Total time for function}} \times 100$$

The results are listed in tabular form, each library in horizontal array and vertically under each class of personnel (Appendix B). Such an arrangement points out the libraries which either do not use certain groups of personnel for some functions, or do use only one class of staff exclusively, or do not perform or report on a function. E. g.,

Library "C" consistently does not report any time for library assistants in any of the functions under the operation of Cataloging; Library "S" reports no time for any staff in the LC Data function, and several libraries use certain staff classes exclusively for some functions, such as Library "C": Original Cataloging is done by professionals only; Added Copies/Volumes are exclusively handled by clerks in Libraries "C" and "G".

For a more comprehensible configuration of information these percentages have been converted into histograms (Figures 10-15). For both the Acquisition and Cataloging operations the clerical staff spends the majority of time, followed by student assistants, then library assistants, and then professionals. The most variation of percentage figures is seen among the professional group for Acquisition (2.77 percent to 28.03 percent).

For these groups of activities where both unit cost and production unit figures were available, graphs have been prepared, plotting the number of units along the X-axis and unit cost on the Y-axis. The position of each library is indicated with the code letter (Figures 1-7). Of greatest interest are the plots for LC Cataloging and Original Cataloging (Figures 6 and 7). Both are using linear increments along both ordinate and abscissa.

LC Cataloging shows at its distribution extremities Library "K" with the lowest unit cost and the highest production units and the reverse conditions for Library "N". Most of the other libraries cluster in a range of ± 0.06 around a unit cost of 0.80 and a production volume of $5{,}600 \pm 700$. A slight indication of a plateau is shown at a unit cost of 0.32, 0.56, 0.74, and 0.86.

The distribution of libraries for Original Cataloging showed a similar pattern with Libraries "A" and "N" at the extremities of the spectrum. The clustering effect, not quite as pronounced, around unit cost 3.00 ±0.5 and production volume 1,300 ±100. A more definite plateau at 2.00 unit cost exists throughout the entire scale of production units.

Process Requests (Figure 1) showed a definite cluster at unit cost 0.75 and 5,000 production units, a secondary cluster, but contiguous, at 0.5 unit cost and 10,000 production units. Titles Ordered (Figure 2), however, showed two distinct and separate clusters, one at unit cost 0.75 ±0.5 and 3 000 ±1,000 production units, the other more concentrated at unit cost 0.5 and 7,500 ±1 500 production units. Volumes Received (Figure 4) indicated a concentration of libraries near 10,000 production units yet over a range of unit cost from 0.25 to 1.00 and a tight cluster of three libraries at unit cost 0.25 and 22,500 production units.

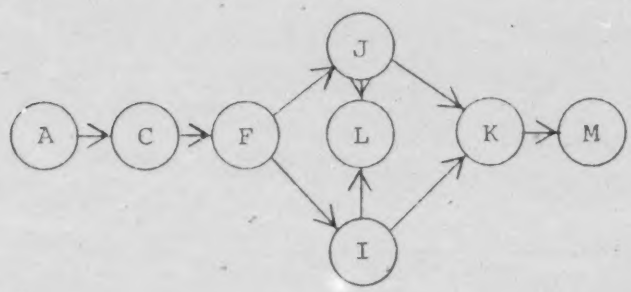
The graphs for Titles Received and Volumes Added were also plotted (Figures 3 and 5) but with the abscissa on a logarithmic scale since half of the libraries' production volume was of a low degree of magnitude. Titles Received showed a plateau at unit cost 0.5 over a range of 2,000 to 20,000 production units. There is a noticeable peaking-effect at 5,000 production units for Library "P", leading the others in unit cost and Library "A" in production units.

Volumes Added shows the greatest variety of configurations: maximum unit cost of 1.25 for Libraries "S" and "E" at 200 and 600 production units, respectively. Three libraries forming a plateau along the Y-axis at the 1 000 production unit mark and about a third of the libraries strung out around unit cost 0.25 and between 4,000 and 17,500 production units.

For all these relationships, recorded here in graph form, there are computer-produced statistical analyses which should help interpret and clarify the observations made at this stage.

Those activities representing meaningful steps in the technical processes operations were included in the form of flowcharts (See Appendix C). Logical connections are identified by the letters assigned to functions by the REPORT. Due to lack of complete information on the entire work process these flowcharts do not comply with the conventional rules but will at times stop without connectors or terminators. Functions with only three or less activities or little connection between activities have been omitted. Also the non-descript activity "Other" has not been recorded.

A summary of the concatenation of functions might be represented in the following manner:



signifying that one of the end activities and products, namely the book or serial of A. Preliminary Activities in I. Acquisition operation is continued by C. Receiving. Books are distributed from C to F. Pre-cataloging in II. Cataloging operation and the search results determine the continuation in either I. L. C. Cataloging or J. Original Cataloging.

Both functions I and J have two types of output: 1) the cards to be processed in function K. Card Reproduction and Processing, followed by function M. File Maintenance; and 2) the books which enter function L. End Processing and are then distributed to be shelved, sent to the bindery, or to be mended. Functions B. Ordering and D. Post-Cataloging although flowcharted, have no connectors and therefore are not a direct part of the functions included in the summary. Functions E. Miscellaneous Activities, G. Obtain and Maintain L. C. Data, and H. Added Copies are either too general, not yielding a discrete unit or product, or consisting of too few activities to require graphic explanation. It must be kept in mind that although there may be a logical sequence to the activities and functions resulting in a more or less continuous work flow or pattern, the observations and measurements of time were NOT made in sequence and do not represent the same material at various stages in the entire technical processing operation, but are rather a "snap-shot" view of the status quo at the various job stations with different material being processed at each point.

Computer-Produced Statistical Analyses

For this phase of the analysis the data presented in the REPORT under the Unit Cost Summary (page 2) and the summary of Production Units (page 4) were used. There is a total of fourteen phases within the technical process for which both unit cost and production unit figures were readily available.

These are:

1. Process Requests
2. Titles Ordered
3. Total Ordering
4. Titles Received
5. Volumes Received
6. Volumes Added
7. LC Cataloging
8. Original Cataloging
9. Total Cataloging
10. Card sets
11. Volumes Processed
12. Total Processed
13. Volumes Bound
14. Volumes Mended

The first statistical test conducted was to determine the amount of correlation between labor unit cost and production units. The data, i. e. unit cost figures as reported for each of the fourteen phases and for each of the nineteen libraries were matched with the corresponding production unit figures per phase and per library and submitted to be run with a statistical program for correlation with item deletion (STATPAK BMD 03 D). The output consisted of the mean and the standard deviation for each of the twenty-eight variables (each containing nineteen items) and a correlation matrix giving the coefficient of correlation (r) for each pair of possible combinations of the twenty-eight variables.

Table 3 lists the correlation coefficients for each pair of corresponding phases, i. e. unit cost and production units for Process Requests, Titles Ordered, etc. All correlations are negative, that is to say, the relationship of unit cost to production units is inverse, or, as one increases the other decreases with more or less dependence of one on the other. The highest coefficient (-0.68476) was found for variable 11 and 25, representing Volumes Processed. Comparing unit cost and production units of Total Cataloging, yielded the lowest coefficient (-0.03646). Remarkably high correlations were noted among variables shown in Table 4; in most cases one variable is a constituent part of its correlated variable; e. g. Total Processing and Card Sets prepared, and accounts for the high value of r (coefficient of correlation).

The second test was designed to examine whether the relationship of the pairs of variables changed as they took on different values or not, and if so, in what direction this trend would go. For this purpose the same sets of data were run in a STATPAK program of polynomial regressions for six degrees with a printout of sources of variations, intercept, regressiong coefficients, a table of residuals, and a graphic representation of the curves resulting from the equations.

In just about all cases the F-values (see Terminology) were very low, except for Volumes Processed which yielded a curve of satisfactory compactness (i. e. compactness of point distribution). All other graphic representations failed to indicate reasonable coherence.[4]

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[4] An error has been detected: during the data input on punched cards the production unit values of Process Requests, Titles Ordered, Total Ordered, and Titles Received for Library "A" only were transposed by one digit to the left.

Chapter 4

DISCUSSION AND IMPLICATIONS

The main purpose of the TPCS was stated to be twofold: 1) to provide accurate cost figures and 2) to produce comparable results. Viewing the results in their totality, the first objective has been successfully accomplished; the variety of data allows several approaches to evaluation. Should the results of one aspect of a processing function be subject to doubt, there are complementary phases and figures to compensate for it and run a cross-check. The accomplishment of the second objective, to produce comparable results, was recognized as inadequate even at the time the REPORT was compiled. Due to the variety of selections each library made of the standardized activities and the number they chose to omit, unit counts, times and dollar amounts, but especially unit cost must be scrutinized before accepting it as valid.

A secondary purpose of the TPCS was not stated but implied, namely to provide the libraries with material and documentation of their functions which they might not have collected as part of their routine statistical record keeping. These figures of time, dollars, and performance indicators (i. e. unit cost) provide information on and insight into the operations, function, and activities of technical processing which the supervisor, department head, head librarian or systems analyst could use in his work. To what extent the raw data have been put to use still remains to be seen. Meanwhile a discussion of the analytical

findings must remain rather academic and purely speculative since the libraries are not identified and their special circumstances are not considered.

Usually, management should determine the nature and extent of data needed for its decision-making processes; however, in most instances senior librarians do not specify these requirements all too readily.[1] From the TPCS and other sources it appears that the statistical factors rank in the following order of priority: 1) Time, 2) Production, 3) Cost, and 4) Unit Cost (or Time). For this interpretation of the findings the discussion shall deal with each one in the above order.

Interpretation of Findings

Time had been chosen as the factor for percentage distribution of work effort as relating to the series of thirteen functions. It is believed that this treatment applied to the activities, would not have yielded any better or more reliable information. Since only productive time was recorded, the figures also give a reliable account of the amount of manpower expended on the several activities. Also the division of time by staff level gives an idea of the allocation of professional and non-professional personnel. Juxtaposing the libraries as the bar charts do, allows easy visual comparison of availability and utilization of professional, library assistant, clerk, and student assistant.

The findings in the first bar chart (Figure 10) show the rounded-off percentages within the Order function. This function is primarily

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[1] G. C. K. Smith and J. L. Schofield, "Administrative Effectiveness: Times and Cost of Library Operations," Journal of Librarianship, 3:4:245-266, October, 1971.

composed of bibliographic searching activities and therefore the majority of libraries draw heavily upon their paraprofessional staff, with the exception of Library "R".

Library of Congress Cataloging was selected for several points of interest (Figure 12); ten of the Libraries (C, D, E, G, I, J, K, M, O, and P) consider this work simple enough to have it performed by library assistants or clerks, whereas seven (B, F, L, N, Q, R, and S) use professional time (up to 90 percent), with Libraries "A" and "H" dividing the task almost equally between professional and library assistants. Original Cataloging (Figure 13), as might be expected, is one of the very few functions in technical processes still demanding most of a professional's time. None of the nineteen libraries have their professionals spend less than 40 percent on this function. Library "C" is an exception in that it uses professionals exclusively.

For summaries of time measurements and staff allocation the totals of the Acquisition function (Figure 11), the Cataloging function (Figure 14), and the sum of both have been chosen (Figure 15). The distributions of time among the four job levels shows generally a peaking of either the library assistant or clerk time with professional and student assistant and clerk time. Library "C" poses a special situation since their cataloging activities show no time for library assistants, casting the burden on to the professional, the clerk, but most heavily on the student assistant. Although this lack of library assistant manpower does not apply to Library "M" the net result is the same.

Finally, the combination of total time spent on acquisition and cataloging experiences even further equalization except for the profile of

Libraries "C", "M", "N", and "R" whose largest manpower investment is at the student assistant level. Labor unit cost ought to show the effect.

In another bar chart (Figure 16) the percentages of one employment category have been represented for each library; Library "N" leads all others in using a preponderance of professional time for the Acquisition function; Library "G" leads in library assistant time, Library "A" for clerical and Library "I" for student assistant time in the Acquisition function.

Figure 17 gives a similar comparison for the function of cataloging; Library "Q" uses a maximum of 26.48 percent professional time, Library "G" mostly library assistant time, Library "S" mostly clerical, and Library "C" mostly student assistant time.

As a result of the TPCS publication libraries have had an opportunity to view their production volumes in comparison to libraries with similar goals and objectives. This study has not identified the individual libraries to include further information on the size of their collections, staffs, and budgets. Based on the summary of expenditures (REPORT, page 1) an approximation can be made as to the size of the library; ranking libraries by the total of their production units (Figure 8) achieves a similar order, as shown in Table 5. Those libraries which emerged as exceptional with regard to staff assignment now appear mostly in the group of small operations suggesting that there might exist a staffing problem due to size.

Let us now take a look at the labor cost reported by the nineteen libraries. Since the ranking appeared to run reasonably parallel to the production units this would indicate that in spite of staffing variations

there does exist a correspondence of size of operation to expenditure. Figure 8 shows a linear relationship for sixteen of the nineteen libraries. Libraries "P" and "R" seem to share the same problem of almost twice the labor cost at the same amount of production units as reported by libraries "H" and "N". On the other hand, Library "A" is able to operate at a cost similar to that of Library "H" but with over twice the production units.

Both exceptional situations are not readily attributable to abnormal staffing patterns since the profiles of Libraries "P" and "R", "H" and "N", and "A" for the activities and functions recorded in the bar charts show no significant aberrations. With uniform labor cost this would only be explicable on the basis of data which the TPCS does not cover, such as physical plant layout, planning and organizing of work procedures, or skill and efficiency of staff.

Before proceeding to the aspect of unit cost, a comment on Table 2 and the information contained therein. The analysis of the TPCS includes the first ninty-three activities. Of these, forty-seven are not performed by ALL libraries and are listed in this table. There are two main types of information presented: 1) the frequency of libraries listed horizontally indicates the degree of importance of the particular activity to the support of technical processes, i. e. the more libraries omitted an activity the less it contributed to the fulfilling of necessary and significant services.

2) A vertical summary indicates the extent to which any of the libraries included the specific technical processing activity in their operational procedures.

Ranked by decreasing frequency, activities number 745, 45, 744, 61, 742, 34, 44, 53, 51, and 743 are the top ten to be dispensable. A look at Appendix A (Standardized Activities) reveals that numbers 745 and 45 are identified with CARDSET which is not used throughout the system; number 744, MCRS, presents a similar situation. Number 61, 34, and 53 are the unspecified categories of "Other" which did not need to be used when the scope of the function was sufficiently comprehensive. Of all the functions the B. Order function was subject to the greatest variation; followed by L. End Processing and F. Pre-Cataloging.

Of all the data presented in the TPCS those of unit cost (i. e. labor unit cost) should be of greatest interest to the libraries. A summation of unit costs for Ordering, Cataloging, and Processing gives a cost factor which can be compared to other libraries, and in our case this comparison shows that between the extremes of $2.12/unit and $12.03/unit most libraries operate within a range of $7.00/unit ± 0.5 (Table 6). Since unit cost is an excellent performance indicator (provided no extreme or unusual conditions have influenced this factor, e. g. an exceptionally high number of acquisitions or exclusively professional staff) it does permit each library to note and evaluate its standing with regard to the others (Table 7).

Unit cost, whether high, low, or normal, is not an explanation of the existing labor and performance conditions but merely an indicator. In any case, more documentation should either be on hand or be made accessible to the administrator or analyst to inform himself thoroughly, gain a comprehensive perspective of the work situation, be it a section, division, department, or the entire technical processing unit, and make

appropriate suggestions for change. Within reason these may be of predictable effect but only a quantitative follow-up can verify their effectiveness.

Implications for the Problem

From the results of the various analytical procedures it becomes apparent that within the population of the nineteen State university and college libraries the technical processes although standardized and specified, still leave a great deal of latitude for implementation and as a performance factor unit cost seems to defy definite linking to its corresponding production units. One purpose of this analysis, to provide summaries, charts, graphs, etc., has hereby been accomplished. During the course of their preparation several other relationships have come to light which were not planned to be included but which will be mentioned in the last section of this chapter (Suggestions for Further Research).

Since unit cost as a performance factor is not readily aligned with production volume it would be indicative of other unspecified variables which have not been identified in this study. A near-zero correlation may be undesirable when hoping and looking for a connection, but on the other hand it is encouraging to provide evidence for the fact that the labor unit cost factor is not solely the relationship between labor cost (wages and salaries) and production units, but presents a more complex, albeit perplexing situation.

As a result of the TPCS and this analysis, the libraries may have better means and evidence whereby to identify their relative positions by a number of criteria. On the basis of central tendencies derived from the

charts and tables the averages may serve as norms and standards, either for in-house use or on a larger scale. Once the norms are available, differences will become apparent and the points and areas of deviation may be identified. Since the procedures for each activity are the same but one library takes more time than another, it might be well to examine the methods in more detail. If, on the other hand, costs differ where times are the same, it may require a review of job grading. The final step in this process of self-evaluation is the pinpointing of phases which may either deserve more detailed study and analysis, or attention as potential sources of problems, or may call for immediate action as a definite cause of less than optimal performance.

Suggestions for Further Research

The writer is well aware that the ideal cost study has not yet been conducted and these remarks are primarily confined to points which were not covered but appear desirable. The term "raw data" has been applied to the figures given in the REPORT, but actually the data collected and used for the compilation of the REPORT should have been available for analysis, comparison, and verification. It is further recommended that in future analyses the factor of unit time be included along with unit cost and the extreme values be tested for correlation with staff distribution, activities omitted, and unit cost. It has also been discovered that the reporting format should allow for the full complement of data to facilitate evaluation and computations. Along with time and labor cost the production units and either the total or their percentages should be included.

For a more comprehensive and exhaustive analysis it is invaluable to include data on the features of each library; e. g. the size of the collection, staff, faculty, student enrollment, and budget; the nature and emphasis of the collection, facilities, and the institution; the distribution of personnel and accessions. With these a more significant profile of each library may be produced to explore variables beyond those of this study.

Chapter 5

SUMMARY AND CONCLUSION

Results of the Study

Based exclusively on the material presented in the REPORT ON A COST STUDY OF SPECIFIC TECHNICAL PROCESSING ACTIVITIES OF THE CALIFORNIA STATE UNIVERSITY AND COLLEGES LIBRARIES (February, 1973) this analysis explores the nature, proportion, relationships, orders, similarity, and relative value of the data. A survey of the literature in costing, standards, and optimization yielded several helpful publications which concluded and concurred on the fact that this area is still largely a frontier. The methodology employed mathematical, graphic, and statistical tools to sort, visualize, and test the data and their relationships. The results have been recorded mainly in the form of graphs, tables, and charts with emphasis on the nature of time, cost and production measurements, and labor unit cost. The results are also discussed in the context of their usefulness to libraries supplying the data. This analysis has not computed or utilized the unit time factor as a viable performance indicator and concludes that labor unit cost is significantly complex to reflect more than the relationship between labor cost and production volume.

Defense of the Hypothesis

The analysis of the data has attempted to discover a relationship and mutual dependence of labor unit cost and production units. Upon the

evidence of plotting these two variables as well as statistically testing their interdependence, no simple and direct correlation was demonstrated. The possibility of observing a direct relationship as reported by MacQuarrie would suggest that other studies following her methodology could produce comparable results. Price[1] mentions a phenomenon termed quantum steps which is observed from data in connection with work load and manpower. On the basis of these two reports and their findings the possibility is entertained that the data contained in the REPORT cannot support the hypothesis by virtue of their nature. Since the methodology and gathering of a certain type of data was performed before this hypothesis was formulated they obviously cannot be expected to fill a role for which they were not intended. By the same token the hypothesis should not be discarded at this point without further research and scrutiny of other data. Finally, it might be emphasized that the purpose of this analysis was not so much to prove the stated hypothesis but rather to examine the data to see if they were of the nature that would support the hypothesis.

Conclusion

The dilemma of standardization seems to consist of two equally valid yet diametrically opposed approaches to the question of performance evaluation in technical processes. On the one side there is the need for information about the productivity and effectiveness of each operation. This calls for unambiguous, unequivocal criteria, units, and methods

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[1] Douglas S. Price, "Rational Cost Information: Necessary and Obtainable," Special Libraries, 65:2:49-57, February, 1974.

that can be manipulated without affecting their integrity. On the other side, each library insists on representing a unique situation which requires unique methods of assessment in order to yield unique data commensurate with the unique information needs. If the situation appears hopeless and beyond resolution it only points up that the basic building blocks composing this complex structure of information sources and information needs have not been isolated even though the units in which they are expressed e. g. minutes, dollars, or items, appear elementary enough. Automation brings with it a tendency to discover and develop units, norms, and standards because its hardware will not function without it. At the present time, therefore, the work performed in the technical processes may still defy the attempts and demands of standardization, not because the nature of the tasks is undefinable, but because of the preponderance of the human element it contains with its unpredictable and indomitable nature.

Until the time arrives when mechanical tasks are performed by machines and work which requires thinking ability is done by humans, studies of this type will continue to provide the foundation of the necessary knowledge for automation. In the meantime, such compromises as cooperative processing within library systems have to fill the gap. Should it ever become apparent that a condition such as the hypothesis suggests, does exist, it would be prudent to decentralize and operate large collections as a series of optimal subunits.

SELECTED REFERENCES

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Bibliographies

Dougherty, Richard M. and Leonard, Lawrence E. Management and Costs of Technical Processes: A Bibliographical Review: 1876-1969. Metuchen, New Jersey, Scarecrow Press, 1970.

Library Technical Processing Cost Study. "Bibliographic Citation List Generated by ERIC/ORBIT." Santa Monica, California: System Development Corporation, November 26, 1973.

Wessel, C. J. and Cohrssen, B. A. "Criteria for Evaluating the Effectiveness of Library Operations and Services, Phase I. Literature and State-of-the-Art." Washington, D. C.: John J. Thompson, Co., February, 1967, AD 649468; Phase II, AD 026105, August, 1968.

ERIC Publications

Mlynarczyk, Frank, Jr. "Measuring Library Costs." ED 045120, 1968

Palmer, David. "Measuring Library Output." ED 045118, 1968.

Price, Douglas S. "Collecting and Reporting Real Costs of Information Systems." Washington: American Society for Information Science, ED 055592, 1972.

Price, Douglas S. "Real Costs for Information Managers." ED 061969, 1972.

Reynolds, Rose. (Compiler) "A Selective Bibliography on Measurement in Library and Information Services." Aslib London, England, ED 052787, April, 1970.

Smith, Stanley V. and Williams, Joel. "Library Statistics of Colleges and Universities: Institutional Data, Part B." Fall, 1971; Basic Information on Collections, Staff, and Expenditures," 1971, ED 065136, Part A, ED 061996.

Taylor, David W. et. al. "An Operations Research Study of the Pacific Northwest Bibliographic Center: Final Report." ED 065127, June, 1972.

Monographs

Baumol, William J. and Marcus, Matityahu. Economics of Academic Libraries. Prepared for Council on Library Resources, American Council on Education, Washington, D. C., 1973.

Blasingame, Ralph and Deprospo, Ernest R., Jr. Effectiveness in Cooperation and Consolidation in Public Libraries. In: Advances in Librarianship, Vol. 1. New York: Academic Press, 1970.

Bourne, Charles P. and Kasson, Madeleine S. Preliminary Report of Standard Cost Data for Selected Library Technical Processing Functions. Prepared for Council on Library Resources, Washington, D. C., 1969.

Dougherty, Richard M. and Heinritz, Fred J. Scientific Management of Library Operations. New York: Scarecrow Press, 1966.

Downs, Robert B. University Library Statistics. Washington, D.C., Association of Research Libraries, 1970.

Hamburg, Morris, et. al. A Systems Analysis of the Library and Information Science Statistical Data System: The Research Investigation, Part I: Text; Part II: Appendices. Interim Report Project No. 8-0802, Office of Education, June, 1970.

Hendricks, Donald D. Comparative Costs of Book Processing in a Processing Center and in Five Individual Libraries. Springfield, Illinois: Illinois State Library, May, 1966.

Organization and Staffing of the Libraries of Columbia University: A Case Study. Prepared by Booz, Allen and Hamilton, Inc. Redgrave Information Resources, 1973.

Periodicals

Armstrong, A. "Cost-Determining Formula for Library Staff," Library Association Record, 74:5:85-6 (May, 1972).

Bellomy, Fred L. "The Systems Approach Solves Library Problems," ALA Bulletin, 62:9:1121-1125, (October, 1968).

Brutcher, Constance, Gessford, Glen, and Rixford, Emmet. "Cost Accounting for the Library," Library Resources and Technical Services, 8:4:413-431, (Fall, 1964).

Cook, J. "Financing a Library/Information Service by Operating a Cost Recovery System," Aslib Proceedings, 24:6:342-349, (June, 1972).

Dean, Hazel. "Size of Cataloging Staffs in Academic Libraries," College & Research Libraries, 7:1:52-57, (January, 1946).

Dougherty, Richard M. "Cost Analysis Studies in Libraries: Is There a Basis for Comparison?" Library Resources and Technical Services, 13:1:136-141, (1969).

Fairholm, Gilbert W. "Essentials of Library Manpower Budgeting," College & Research Libraries, 31:5:332-340, (September, 1970).

Fasana, Paul J. and Fall, James E. "Processing Costs for Science Monographs in the Columbia University Libraries," Library Resources and Technical Services, 11:1:97-114, (Winter, 1967).

Franklin, Robert D. "Book Acquisition Costs," Library Journal, 90:7:1612-3, (April 1, 1965).

Gipson, John S. "Total Cost of Acquisitions in a Community College," College & Research Libraries, 28:4:273-76, (July, 1967).

Hamburg, Morris., Ramist, Leonard E., and Bommer, Michael. "Library Objectives and Performance Measures and their use in Decision Making," Library Quarterly, 42:1:107-128, (1972).

Heinritz, Fred J. "Optimum Allocation of Technical Services Personnel," Library Resources and Technical Services, 13:1:99-101, (Winter, 1969).

Kochen, M., and Deutsch, K. W. "Toward a Rational Theory of Decentralization: Some Implications of a Mathematical Approach," American Political Science Review, 63:3:734-749, (September, 1969).

Kountz, John Charles. "Library Cost Analysis: A Recipe," Library Journal, 97:3:459-64, (February, 1972).

Leimkuhler, Ferdinand F., Cooper, Michael D. "Cost Accounting and Analysis for University Libraries," College & Research Libraries, 32:6:449-464, (November, 1971).

Leonard, Lawrence E. "The Colorado Academic Libraries Book Processing Center Project Time Study Methodology," Library Resources and Technical Services, 13:1:116-127, (1969).

MacQuarrie, Catherine. "Cost Survey: Cost of Ordering, Cataloguing and Preparations in Southern California Libraries," Library Resources and Technical Services, 6:4:337-350, (1962).

Maier, Joan M. "Analyzing Acquisitions and Cataloguing Costs," Library Resources and Technical Services, 13:1:127-135, (1968).

Miller, Robert A. "Cost Accounting for Libraries: Acquisition and Cataloging," Library Quarterly, 7:4:511-536, (October, 1937).

Mullick, Satinder K. "Optimal Design of a Stochastic System with Dominating Fixed Costs," Journal of Financial and Quantitative Analysis, 1:55-74, (September, 1966).

Murphy, Marcy and Johns, Claude J., Jr. "Financial Data for Future Planning at the U. S. Air Force Academy Library," Special Libraries, 65:1:4-11, (January, 1974).

Price, Douglas S. "Rational Cost Information: Necessary and Obtainable," Special Libraries, 65:2:49-57, (February, 1974).

Raffel, J. A. and Shishko, R. "Centralization vs. Decentralization: A Location Analysis Approach for Libraries," Special Libraries, 63:3:135-43, (March, 1972).

Rider, Fremont. "Library Cost Accounting," Library Quarterly, 6:4:331-381, (October, 1936).

Robertson, S. E. (et. al.) "Standard Costing for Information Systems: Background to a Current Study," Aslib Proceedings, 22:9:452-457, (September, 1970).

Slamecka, Vladimir. "A Selective Bibliography on Library Operations Research," Library Quarterly, 42:1:152-158, (January, 1972).

Smith, G. C. K., and Schofield, J. L. "Administrative Effectiveness: Times and Cost of Library Operations," Journal of Librarianship, 3:4:245-266, (October, 1971).

Tesonik, Mary E. and DeHart, Florence E. "Unpublished Studies of Technical Service Time and Costs: A Selected Bibliography," Library Resources and Technical Services, 14:1:56-67, (Winter, 1970).

Vickery, B. C. "Research by Aslib into Costing of Information Services," Aslib Proceedings, 24:6:337-341, (June, 1972).

Voos, Henry. "Standard Times for Certain Clerical Activities in Technical Processing," Library Resources and Technical Services, 10:2:223-227, (1966).

Welch, Helen M. "Technical Services Costs, Statistics, and Standards," Library Resources and Technical Services, 11:4:436-442, (Fall, 1967).

Wilkin, A. P., Reynolds, R., and Robertson, S. E. "Standard Times for Information Systems: A Method for Data Collection and Analysis," Journal of Documentation, 28:2:131-150, (June,1972).

Wynar, Bohdan S., and Malinowsky, Harold R. "Cost Analysis Study, Technical Services Division, University of Denver Library," Library Resources and Technical Services, 7:4:312-326, (1963).

APPENDIX A

STANDARDIZED TECHNICAL PROCESSING ACTIVITIES

The California State University and Colleges
Technical Processing Cost Study
1972
Standardized Technical Processing Activities
Scope of Functions Performed

I. Acquisitions

A. Preliminary Activities

1. Open, sort and distribute incoming mail:
Mail is opened and sorted into like items (publishers' advertisements, catalogs, book requests, invoices, incoming books, serials, etc.), and distributed to appropriate processing point.

2. Review book order requests:
Book order requests are examined to determine their bibliographic completeness, their suitability to the scope of the collection, and the status of the funds against which they will be charged. Book order requests satisfy specific information needs and build the collection in departmental areas. Includes replacement orders.

~~3. Review selection media:~~
~~Selection media are periodically reviewed to identify new titles which should be added to the collection. Placement of orders by review of selection media satisfies the general subject scope of the collection.~~

~~4. Select titles to be ordered or kept:~~
~~Titles which satisfy departmental or general interests are selected for order placement, within budgetary limitations. Includes approvals and gifts.~~

5. Type library order request card:
Typist prepares library order request card from bibliographic information supplied by the requester. Information may be sent in the form of publishers' flyers, brochures, handwritten request lists, catalogs, bibliographies, etc. A single order request card is typed or handwritten for each title selected. Libraries frequently supply order request cards to each academic department, with instructions for order placement. They can then use the request card completed by the department rather than duplicate work with a separate typing.

6. Other

B. Ordering

7. Bibliographic searching: (corresponds to 42)
Requests are searched. (1) To establish entry, complete missing bibliographic information, and determine availability of title and LC copy through *Cumulative Book Index, National Union Catalog, Books in Print, Book Publishing Record*, card catalog, etc.; (2) to determine possible duplication of title, through card catalog and outstanding order file. Equivalent to activity 42 in Pre-Cataloging.

743. Search NUC:
Search NUC and LC catalog of printed cards to verify bibliographic data and locate cataloging information. Includes Polaroiding.

744. Search IDC MCRS:
Search IDC-Micrographic Cataloging Retrieval System indexes to locate bibliographic data for cataloging input.

745. Search CARDSET:
Search CARDSET indexes to locate bibliographic data for cataloging input.

8. Assign vendor and fund:
Librarian designates dealer or publisher with whom an order will be placed, and indicates the fund to be encumbered.

9. ~~Prepare multiple order record:~~
~~Typist completes multiple order form for each title ordered, following oral or written instructions for each group of orders. Multiple order form may also be xeroxed or otherwise reproduced.~~

10. Type purchase requisition, etc.:
Typist prepares requisition or order, either in ordering a group of titles (initial order), or as a confirming request for payment for materials already received.

11. Revise typing:
Librarian examines typed orders, noting that information is accurately typed and is complete.

12. Sign and mail requests:
Requests are signed, appropriate vendor copies are placed in addressed envelopes and orders are mailed to assigned vendor or publisher.

13. Burst and file forms:
All forms are separated and sorted for distribution. Order forms prepared by xerox or other reproduction are cut apart and sorted for distribution. Sorted forms are filed in designated files; i.e., outstanding orders file, purchase requisition or order file, fund file, etc. Includes all acquisitions filing except as noted in Activity 1.

14. Encumbrance or prepayment routine:
Encumbrance entry is made in ledger under appropriate fund for each title ordered. If library budgetary records are calculated on unit record equipment, an encumbrance card(s) is keypunched from order record information.

15. Other

C. Receiving

16. Unpack books; check against packing list or invoice:
Packages containing books are opened, books are arranged for checking, and checked against packing slip and/or invoice. Incoming books are screened to determine which need special handling.

17. ~~Prepare confirming order:~~
~~Type order form for title received on approval plan, standing order, etc. Burst forms and file in appropriate file.~~

18. Check outstanding order file:
Outstanding order file slips are pulled, or date of receipt of book is noted on the slip which remains in order file until processing completed.

19. Check in serials and periodicals on Kardex:
Serials are separated from the other titles and are entered in the Kardex records before further processing. Includes loose-leaf services.

20. Collate books:
Book is examined page by page to determine whether signatures have been properly bound and print is clear.

21. Book return procedure (incorrect shipment, defective copy, approval books):
Books which have been incorrectly supplied, approval books not selected, and defective copies are prepared for return shipment to the supplying source.

22. Book accessioning routine:
Accession number is stamped on book for positive identification of individual title. Number may be stamped or otherwise recorded on one or more records as aid in identification, and in slipping charge cards. Formal accessions record (ledger) may be maintained in which accessions number, author, title, publisher, date, order source, price, etc., are recorded for each item accessioned. Informal accessions record may be in form of notebook of invoices or order slips stamped with accessions number.

23. Write sourcing information:
Information on source of order is written in each book, usually on the page following the verso of the title page: (1) Copy number of book; (2) date of receipt of book in library; (3) source of order (vendor or publisher); (4) list price of book.

24. Prepare gift record form:
A gift record is prepared for each book given the library which is added to the collection. (*Note:* A library order request card, or multiple order record may be typed, depending upon how many copies of the record the library requires in processing gift materials.) Includes exchange.

25. Book distribution routine:
A process form may be prepared to be routed with each title. Books are forwarded to the Cataloging Department, or placed in a holding area, depending upon available copy and processing treatment.

26. Prepare receiving report (claims schedule):
A report is prepared certifying receipt of materials for which payment is requested.

27. Prepare invoices for payment:
Invoices are checked to insure that all titles listed on the invoice have been received. Any discrepancies (incorrect shipment, defective copy, etc.) are noted, necessary

changes are made, and the invoice is certified for payment, either through preparation of a receiving report or by signature of the librarian on the invoice itself. Forms are sent to the Business Office for payment.

28. Expenditure routine:
Expenditure amounts are posted under appropriate titles and funds in the ledger (or an expenditure card is keypunched for each title paid). Fund encumbrance and expenditure data are maintained on current basis on a ledger or on punched cards. Periodic reports are distributed to academic departments for which library maintains records, and to purchasing or Fiscal Office. Credit memos are accounted for.

29. Other

D. **Post-Cataloging**

30. Clear or correct in-process file:
Order slips are pulled from outstanding orders file when Acquisitions receives notification from Cataloging that title is completely processed, and is ready for circulation.

31. File forms, etc., in completed records or discard:
Prepared forms used in the order process are filed in required completed orders files, or are discarded when removed from the in-process files.

32. Requester notification routine:
Requester is notified that title is processed and is ready for circulation.

33. Periodic accessions list routine:
A list of selected or total recent acquisitions is prepared on a periodic basis, and sent to faculty members. Includes serials listings, directories, print-outs, etc.

34. Other

E. **Miscellaneous Activities**

35. Correspondence, reports, statistics:
Miscellaneous correspondence, report preparation, and compilation of statistics directly relating to technical processing activities and not included elsewhere.

36. Claims routine:
Order files are periodically searched to locate orders which have been outstanding beyond the established period for claims. Form letters are prepared (or multiform slips are reproduced) and mailed to the ordering source, requesting explanation of delay in receiving requested material.

37. Cancellations routine:
Orders which the source cannot supply are cancelled, with possible placement to another source (dealer, publisher, out-of-print dealer). Appropriate forms are pulled from all in-process files at time of cancellation, reason noted, and determination made of desirability of a re-order.

38. Out-of-print order routine:
Desired out-of-print materials may be ordered through an out-of-print dealer or advertised in a publication such as the *Antiquarian Bookman* or the *Library Bookseller (TAAB)*. A letter is prepared for either purpose and mailed to the source. A request form is typed for each title ordered and filed in the in-process file.

39. Process inquiries:
Answer specific inquiries from requester regarding status of an order in process; general inquiries concerning status of in-process order noted in public catalog by patron; general inquiries regarding bibliographic information, i.e., author, title, date of publication, publisher, price, etc. Includes all acquisitions inquiries both to and from vendors.

40. Other

II. Cataloging

F. Pre-Cataloging

41. Sort books, assign and distribute:
Books delivered from the Acquisitions Department are sorted into categories for processing: i.e., added volumes, added copies, books with LC copy, books for which LC cards/copy must be searched, original cataloging, etc. Books are placed on book trucks and distributed to the appropriate processing area.

42. Search for cataloging copy; verify bibliographic information:
Additional searching is done to verify bibliographic data and to locate cataloging copy or copy closely approximating titles to be cataloged. Includes searching proof slip file.

43. Search NUC:
Search NUC and LC catalog of printed cards to verify bibliographic data and locate cataloging information. Includes Polaroiding.

44. Search IDC-MCRS:
Search IDC-Micrographic Cataloging Retrieval System indexes to locate bibliographic data for cataloging input.

45. Search CARDSET:
Search CARDSET indexes to locate bibliographic data for cataloging input and card reproduction.

46. Other

G. Obtaining and Maintaining LC Data

47. Order LC cards or other unit cards:
Cards to be ordered are determined, order is prepared (multiple-form LC slip, or preprinted, typed LC order), LC or other unit card order (Wilson cards, etc.) is sent, and interim (outstanding) order slip is filed. Unit cards are frequently ordered at the time orders for new titles are placed.

48. Receive and arrange LC cards or other unit cards:
Upon receipt of cards, order slip is pulled, cards are sorted, and matched, or held for filing (and later matching with incoming books).

49. Receive and arrange LC proof slips or proof sheets:
Upon receipt of proof slips, slips are examined, sorted and matched with books or held for filing. Proof sheets are examined, cut apart, sorted, and matched with books or held for filing.

50. File LC copy (cards or proof):
LC copy is sorted (unless received pre-sorted) and filed as it is received.

51. Other

H. Added Copies/Added Volumes Routine

52. Added copies/added volumes routine:
The main entry and shelf list cards are pulled, added copies or volumes are entered on these records (also the Kardex record in some cases) and the books are then ready for physical processing.

53. Other

I. LC Cataloging (i.e., that performed with LC Copy)

54. Match LC cards or proof copy and books:
Upon receipt of both book and LC card set, a match is accomplished through systematic, periodic check of both book holding shelves and LC card holdings drawers, or a proof copy is pulled.

55. Catalog and classify with LC cards/copy:
LC cards or copy are compared with book to insure that cards match the book in question. Titles are classified (LC or Dewey Decimal), entries may be checked in the public catalog, subjects established, and modifications made, if necessary. Call number is written inside the book.

55a. Shelf List Checking: (See 60)

56. Revision of Cataloging:
Cataloging and classification are checked by *someone other than the cataloger himself* to ensure correctness and appropriateness. Corrections or changes are made as necessary.

57. Other

J. Original Cataloging (No LC Copy Available)

58. Original cataloging and classifying:
Cataloger performs descriptive cataloging, subject analysis, classification, and authority work (i.e., name subject, etc.) for titles for which no LC copy is available.

Cataloger prepares a work slip or work sheet to be used in typing copy for catalog card reproduction.

59. Revision of Cataloging:
Cataloging and classification are checked by *someone other than the cataloger himself* to ensure correctness and appropriateness. Corrections or changes are made as necessary.

60. Shelf List Checking:
The shelf list is examined to prevent duplicate assignment of a call number. A temporary shelf list slip/card is prepared and filed to reserve the call number while the book is being processed, and before a permanent shelf list card is prepared and filed.

61. Other

K. Card Reproduction and Processing

62. Type complete card sets:
Complete card sets are typed; or additional cards are typed as required to complete card sets.

63. Type master card:
A master card is typed, to be used in reproducing sets of unit cards by electrostatic or photoreproductive processes. A complete set of catalog cards may be typed in lieu of reproducing the set.

64. Revise master card:
Master card is proofread to correct any typing errors. If a complete set of catalog cards is typed, each card must be examined for errors.

65. Type modification on a card or proof slip:
Close copy is modified, if little modification is required. Modified copy then serves as master card for reproduction of card sets.

66. Reproduce card sets (other than typing):
Some method of card reproduction is used to duplicate a set of catalog cards from each master card typed. Include time spent on maintenance of equipment if done by Technical Processing staff.

67. Sort cards into sets:
Reproduced cards are sorted into sets after reproduction (and cutting, if necessary).

68. Type call number, added entries:
Call number is typed on cards in the set; established added entries are typed at top of cards in the set; shelf list card is typed.

69. Revise typing on card sets:
Cards are revised to verify accuracy of typing, both of call number and added entries.

70. Prepare authority cards:
Authority cards are typed or otherwise prepared as necessary for authority files mentioned.

71. Prepare cross-reference cards:
Cross-reference cards are typed or otherwise prepared as new subject (and corporate) entries are established, and emphasis on established subjects changes.

72. Other

L. End Processing

73. Prepare circulation card:
A circulation charge card(s) is typed or prepared for all books processed into the library's circulation collection.

74. Prepare book pocket:
Identifying bibliographic elements may be typed on the book pocket; or adhesive label containing elements may be attached to the pocket.

75. Mark call number or place label on spine of volume:
Call number is hand lettered or otherwise placed on the spine of a book (through use of self-adhesive labels, commercial labeling machines, etc.). Special location designation strips and symbols are affixed to spine.

76. Affix pocket and date due slip. Affix gift plate:
Book card pocket is glued into book in a predetermined position. Date due slip is tipped in. Gift plate is pasted in book in a fixed position.

77. Affix biographical and review material in book:
Biographical material about the book's author, and significant reviews found on dust jacket are clipped and pasted in book.

78. Stamp property marks:
The library's identifying stamp is placed on the book at several fixed locations (i.e., edge stamp, title page, secret page, etc.).

79. Affix plastic jacket to book:
Plastic jacket is placed over dust cover and affixed to the book.

80. Bindery Routine (Preparation and Receiving):
Paperback books and other paperbound materials are prepared for shipment to the State Printer or local bindery. Paperwork required for the bindery is prepared. Upon return, the shipment is checked, records changed to reflect titles, which have been returned, and volumes readied for processing.

81. Library binding and mending:
Libraries equipped for "home binding" may bind paperback books or place in pamphlet binders. Includes general repair or mending.

82. Revise completed books before forwarding to circulation:
Completely processed books are checked to insure accuracy of typing and processing.

83. Distribution:
Books are sorted according to various categories or destinations, e.g., reference, new book display shelf, and are delivered to their destination.

84. Cancellations and Withdrawals:
Materials which are declared lost (cancellations) or withdrawn because of excessive wear, obsolescence, etc., require that the library records be changed, catalog cards, shelf lists, etc., be removed or changed as appropriate and the physical volumes, if available, are stamped "withdrawn" and discarded.

85. Other

M. File Maintenance

86. Sort and arrange shelf list:
Cards (shelf list, ~~main catalog~~, authority, cross-reference, etc.) are arranged in order in which they will be filed.

87. File shelf list:
Cards are filed in the shelf list, ~~public catalog~~ and other files following library's rules for systematic arrangement of card files.

88. Revise filing of shelf list:
Filing is checked to insure its accuracy; corrections are made where necessary.

89. Sort and alphabetize *all* catalog cards in the set:
This function includes the sorting and alphabetizing of card sets for new titles, main entry and analytic cards for added volumes, cards for titles recataloged or reclassified, cards withdrawn to update entry, etc. These cards are arranged in 26 groups according to the 1st letter of the 1st word of catalog entry with additional sortings of each subgroup by 2nd or 3rd letter, and the final arrangement of each subgroup in alphabetic order, word by word, to the end of the entry in each card.

90. File *all* catalog cards:
Interfiles of all catalog cards sorted and alphabetized as in 89 in the public catalog and the authority file which the catalog department maintains.

91. Revise filing of all catalog cards:
This function may include any or all of the following activities: review of filing of catalog cards as mentioned in 90; notification and correction of filing errors, and the making of filing decisions.

92. Catalog maintenance (other than filing):
Replacement of worn or mutilated cards, correction of changed or incorrect entries, etc., is entailed in maintenance of the card catalog.

93. Other

FACTORIALS USED TO DERIVE SUMMARY AND UNIT COSTS

(Note: numbers refer to defined activities)

GENERAL SUMMARY

ORDERING

Total = Σ2, 5, 6,7*,742*,743, 744, 745, 8, 10, 11, 12, 13, 14, 15, 36, 37, 38

$$\text{Unit} = \left(\frac{\Sigma 2, 5, 6,7^*,742^*,743, 744, 745}{\#\text{ requests processed}}\right) \text{ plus } \left(\frac{\Sigma 8, 10, 11, 12, 13, 14, 15, 36, 37, 38}{\#\text{ titles ordered}}\right)$$

$$\% = \frac{\text{Ordering total}}{\text{Library total}}$$

CATALOGING

Total = Σ41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 55a, 56, 57, 58, 59, 60, 61

$$\text{Unit} = \left(\frac{\Sigma 41\text{-}51, 54\text{-}61}{\#\text{ titles cataloged}}\right)^{**} \text{ plus } \left(\frac{\Sigma 52, 53}{\#\text{ added copies/volumes}}\right)$$

$$\% = \frac{\text{Cataloging total}}{\text{Library total}}$$

** Correction: $\left(\frac{\Sigma 41\text{-}51}{\#\text{ LC titles}}\right)$ plus $\left(\frac{\Sigma 54\text{-}61}{\#\text{ original titles}}\right)$

PROCESSING

Total = Σ62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 82, 85

$$\text{Unit} = \left(\frac{\Sigma\ 62\text{-}72}{\#\text{ card sets produced}}\right) \text{ plus } \left(\frac{\Sigma\ 73\text{-}79, 82, 84}{\#\text{ volumes processed}}\right)$$

$$\% = \frac{\text{Processing total}}{\text{Library total}}$$

RELATED ACTIVITIES

Total = Σ 1, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 39, 40, 80, 81, 83, 84, 86, 87, 88, 89, 90, 91, 92, 93

$$\% = \frac{\text{Related activities total}}{\text{Library total}}$$

*Information for activity 7 was erroneously entered as 742 in a few instances. Therefore, to ensure inclusion of all data in this report, 742 is also shown in the factorials.

APPENDIX B

TIME PERCENTAGES

TIME PERCENTAGES

I. Acquisition A. Preliminary

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	2.48	15.49	77.34	4.68
B	22.08	24.30	42.86	10.76
C	26.92	1.73	44.19	27.16
D	13.50	11.03	44.57	30.90
E	10.90	13.81	30.97	44.32
F	11.05	11.34	62.50	15.11
G	5.80	8.29	69.61	16.30
H	54.27	-----	15.44	30.30
I	13.89	9.87	55.20	21.05
J	9.50	37.59	24.00	28.91
K	12.53	6.47	41.33	39.67
L	74.38	10.48	13.75	1.40
M	0.99	9.94	30.78	58.28
N	40.81	14.57	27.29	17.33
O	3.29	29.25	36.09	31.37
P	13.72	9.44	40.13	36.72
Q	25.98	15.12	34.23	24.67
R	18.06	12.55	29.49	39.89
S	12.72	27.25	54.88	5.14

TIME PERCENTAGES

I. Acquisition B. Order

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	1.89	22.10	74.38	1.61
B	6.20	25.20	31.75	36.85
C	9.69	13.92	42.37	34.02
D	7.78	5.77	68.82	17.63
E	19.16	33.78	35.58	11.48
F	6.78	13.86	59.29	20.07
G	0.93	63.78	8.63	26.66
H	11.18	-----	55.39	33.43
I	4.88	10.41	23.35	61.36
J	5.11	47.94	36.06	10.89
K	13.63	7.31	63.30	15.76
L	12.13	48.69	36.52	2.66
M	0.98	23.82	53.95	21.25
N	55.32	9.09	35.35	0.24
O	2.92	24.23	46.36	26.49
P	5.75	7.14	62.22	24.89
Q	8.22	45.06	36.27	10.45
R	25.88	15.58	26.94	31.59
S	15.34	20.97	41.97	21.72

TIME PERCENTAGES

I. Acquisition C. Receive

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	4.48	8.83	67.94	18.75
B	2.26	22.26	64.27	11.20
C	16.11	6.67	61.44	15.78
D	3.03	8.32	73.88	14.78
E	6.03	9.13	44.73	40.11
F	-----	3.54	42.57	53.89
G	3.43	25.63	64.64	6.30
H	7.05	-----	82.41	10.54
I	0.31	38.17	13.94	47.58
J	0.57	20.59	41.22	37.62
K	5.10	5.20	64.73	24.98
L	2.58	11.92	70.73	13.71
M	14.21	12.49	32.25	41.05
N	13.73	23.76	25.39	37.11
O	0.61	12.33	50.27	36.79
P	0.96	5.24	52.25	41.55
Q	5.67	20.05	52.02	22.26
R	9.51	11.58	49.29	29.48
S	14.97	46.31	24.05	14.67

TIME PERCENTAGES

I. Acquisition D. Post-Cataloging

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	3.65	25.91	59.36	11.07
B	67.31	5.13	7.05	20.51
C	14.74	-----	6.32	78.94
D	3.31	49.69	41.62	5.38
E	15.58	-----	23.62	60.80
F	-----	3.47	1.74	94.79
G	-----	-----	100.00	-----
H	19.35	0.81	39.25	40.59
I	11.49	16.98	52.83	18.70
J	-----	18.75	15.63	65.62
K	7.57	23.19	62.78	6.47
L	12.69	45.52	38.76	3.03
M	5.98	8.15	51.82	34.06
N	21.92	21.79	27.60	28.69
O	12.12	31.48	36.70	19.70
P	1.09	6.21	29.87	62.83
Q	18.03	38.22	16.57	27.17
R	13.19	6.28	6.75	73.78
S	-----	70.59	-----	29.41

TIME PERCENTAGES

I. Acquisition E. Miscellaneous

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	8.87	24.87	65.34	0.90
B	14.09	32.76	48.95	4.20
C	19.46	7.67	41.11	31.76
D	10.39	18.46	60.13	11.02
E	19.27	24.14	56.59	-----
F	4.31	25.52	50.83	19.34
G	32.65	50.71	16.64	-----
H	37.66	2.98	52.41	6.95
I	3.90	46.54	47.96	1.60
J	13.83	25.05	52.93	8.20
K	26.00	8.50	56.74	8.76
L	18.57	27.36	49.26	4.81
M	13.07	16.22	54.09	16.62
N	26.61	16.05	47.52	9.82
O	4.87	11.46	75.78	7.89
P	16.91	17.81	33.57	31.72
Q	33.11	22.05	37.45	7.40
R	9.93	27.72	29.15	33.20
S	23.94	24.08	23.28	28.70

TIME PERCENTAGES

I. Acquisition (Total)

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	4.13	16.96	70.31	8.60
B	8.81	25.00	43.63	22.56
C	15.86	8.96	46.31	28.87
D	7.02	9.88	66.21	16.89
E	13.78	21.71	39.97	24.54
F	4.19	10.71	50.83	34.27
G	6.79	39.95	38.96	14.29
H	19.26	0.29	54.94	25.51
I	4.71	25.05	29.01	41.23
J	6.21	32.93	39.97	20.89
K	13.18	7.22	60.45	19.15
L	16.41	28.27	48.51	6.81
M	7.20	17.64	46.54	28.62
N	28.03	18.37	31.00	22.60
O	2.77	18.35	52.33	26.55
P	6.39	7.98	51.27	34.36
Q	15.68	28.88	38.87	16.57
R	16.50	15.71	33.69	34.09
S	15.78	29.41	38.88	19.92

TIME PERCENTAGES

II. Catalog F. Precatalog

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	19.49	15.15	53.36	11.99
B	16.30	26.82	34.12	22.75
C	3.63	-----	21.49	74.88
D	3.66	56.72	16.93	22.69
E	16.98	11.62	15.10	56.30
F	23.75	37.70	35.84	2.71
G	0.72	65.37	14.29	19.62
H	33.55	31.12	34.88	0.44
I	-----	6.46	23.61	69.93
J	4.22	27.41	42.54	25.84
K	64.28	13.70	18.83	3.19
L	18.92	7.26	22.00	51.82
M	11.40	14.00	43.06	31.54
N	10.02	12.42	12.82	64.74
O	39.00	21.42	38.95	0.63
P	5.61	43.73	3.72	46.94
Q	20.12	22.45	20.48	36.95
R	40.83	9.89	26.36	22.92
S	75.49	2.94	-----	21.57

TIME PERCENTAGES

II. Catalog G. LC Data

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	-----	2.11	17.89	80.00
B	1.49	34.83	38.81	24.87
C	-----	-----	100.00	-----
D	12.50	35.79	5.12	46.59
E	40.65	17.99	22.03	19.33
F	-----	2.32	97.68	-----
G	0.19	5.66	21.70	72.45
H	0.81	-----	22.37	76.82
I	-----	12.33	26.58	61.10
J	-----	16.22	20.48	63.30
K	-----	0.06	1.72	98.21
L	0.49	1.29	20.90	77.31
M	1.00	4.83	22.97	71.20
N	3.34	7.01	2.61	87.04
O	0.20	1.58	86.07	12.15
P	1.08	1.44	-----	97.48
Q	10.78	10.04	7.51	71.67
R	54.28	11.36	5.31	29.05
S	-----	-----	-----	-----

TIME PERCENTAGES

II. Catalog H. Added Copy/Volume

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	1.88	7.43	90.68	-----
B	18.97	36.64	40.94	3.45
C	-----	-----	100.00	-----
D	3.38	76.24	5.48	14.90
E	16.80	83.20	-----	-----
F	0.07	8.17	67.48	24.28
G	1.74	45.22	53.04	-----
H	20.99	37.45	41.56	-----
I	-----	47.52	49.65	2.84
J	1.53	52.48	30.00	15.99
K	29.83	9.15	56.66	4.35
L	23.36	19.01	54.35	3.27
M	-----	55.31	21.42	23.27
N	6.43	93.57	-----	-----
O	13.70	19.55	65.79	0.96
P	17.20	-----	48.39	34.41
Q	30.25	8.60	36.84	24.31
R	10.09	38.75	44.57	6.59
S	11.98	54.79	25.45	7.78

TIME PERCENTAGES

II. Catalog I. LC Cataloging

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	48.33	49.15	1.96	0.56
B	63.55	22.05	11.84	2.56
C	-----	-----	81.39	18.61
D	7.51	85.13	2.23	5.13
E	20.08	25.51	48.52	5.89
F	50.13	25.82	24.05	-----
G	1.16	62.54	35.24	1.06
H	42.26	49.18	8.11	0.45
I	7.91	71.50	8.65	11.95
J	2.02	58.53	31.92	7.53
K	7.28	4.69	87.88	0.16
L	91.34	-----	4.55	4.11
M	14.52	45.05	18.22	22.21
N	50.39	47.84	0.14	1.63
O	24.36	58.94	7.49	9.20
P	17.45	27.38	31.03	24.13
Q	83.12	5.92	10.94	0.02
R	72.25	17.19	6.74	3.82
S	45.20	15.68	37.74	1.38

TIME PERCENTAGES

II. Catalog J. Original Cataloging

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	99.38	0.62	-----	-----
B	84.26	3.34	12.26	0.14
C	100.00	-----	-----	-----
D	79.77	11.33	1.02	7.88
E	92.95	3.72	3.02	0.31
F	63.68	22.84	13.48	-----
G	40.34	55.97	3.69	-----
H	97.18	2.82	-----	-----
I	76.44	20.63	2.93	-----
J	76.78	17.07	5.87	0.28
K	93.66	0.73	4.11	1.49
L	81.54	0.03	18.05	0.38
M	73.57	11.07	3.69	0.66
N	72.37	26.31	-----	1.32
O	64.63	19.36	8.33	7.69
P	91.27	8.56	0.17	-----
Q	99.40	0.60	-----	-----
R	97.83	0.72	0.28	1.17
S	74.92	-----	19.03	6.04

TIME PERCENTAGES

II. Catalog K. Card Processing

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	4.52	29.37	53.72	12.39
B	2.12	25.34	72.36	0.18
C	0.80	-----	76.02	23.18
D	1.61	11.59	79.37	7.43
E	14.69	2.05	56.67	26.59
F	14.95	28.01	28.69	28.35
G	-----	25.93	60.76	13.31
H	7.51	0.63	88.29	3.57
I	4.51	2.15	89.23	4.11
J	0.16	13.80	49.02	37.02
K	2.53	10.52	72.70	14.25
L	3.44	17.05	78.27	1.24
M	1.37	16.86	40.65	41.12
N	6.37	23.18	39.80	30.65
O	8.73	9.99	75.49	5.79
P	5.44	12.27	72.57	9.72
Q	12.61	17.43	67.73	2.24
R	1.54	8.10	59.22	31.13
S	7.39	12.32	80.17	0.12

TIME PERCENTAGES

II. Catalog L. End Processing

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	2.42	13.74	44.45	39.39
B	3.45	8.28	48.70	39.57
C	10.40	-----	32.35	57.25
D	1.45	5.14	51.74	41.67
E	1.17	1.45	58.34	39.04
F	0.33	2.95	50.98	45.74
G	0.03	29.96	23.84	46.17
H	3.90	0.15	62.82	33.13
I	1.37	5.85	54.52	38.26
J	0.89	20.79	26.82	51.50
K	9.33	11.36	32.72	46.59
L	7.09	1.43	51.58	39.90
M	6.63	5.57	9.88	77.92
N	1.81	23.98	40.35	33.85
O	2.86	13.83	20.09	63.23
P	0.31	1.55	52.27	45.87
Q	1.14	9.24	53.53	36.09
R	0.86	14.70	30.00	54.44
S	2.81	16.19	60.87	20.13

TIME PERCENTAGES

II. Catalog M. Filing

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	11.58	23.12	40.12	25.09
B	13.52	7.77	51.16	27.55
C	4.75	-----	15.72	79.53
D	16.14	2.60	47.03	34.23
E	8.68	20.93	46.28	24.11
F	16.84	20.78	35.42	26.96
G	0.48	14.84	78.61	6.07
H	6.16	1.84	82.57	9.43
I	5.55	19.86	39.48	35.11
J	15.46	20.40	31.19	32.95
K	23.02	7.54	17.07	52.37
L	16.68	7.29	35.86	40.17
M	1.13	14.59	31.05	53.23
N	8.51	23.95	10.27	57.27
O	13.35	22.75	61.68	2.22
P	7.93	1.60	31.69	58.78
Q	6.43	15.28	45.14	33.14
R	13.06	2.57	32.24	52.13
S	15.58	2.29	55.33	26.80

TIME PERCENTAGES

II. Catalog (Total)

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	21.19	20.92	39.30	18.59
B	19.20	17.28	46.80	16.72
C	8.60	-----	37.36	54.04
D	16.21	22.94	37.67	23.18
E	18.34	16.40	42.34	22.91
F	22.90	20.32	35.90	20.88
G	1.79	34.16	38.99	25.06
H	24.88	10.11	49.18	15.83
I	11.33	18.23	43.46	26.98
J	13.29	26.00	30.67	30.04
K	21.93	8.31	40.83	28.92
L	25.14	6.51	42.34	26.02
M	11.19	17.37	23.44	48.00
N	20.88	25.54	20.22	33.36
O	19.74	22.71	39.05	18.50
P	11.35	11.12	42.67	34.86
Q	26.48	12.39	37.47	23.66
R	22.62	10.53	32.12	34.73
S	22.17	13.31	53.07	11.44

TIME PERCENTAGES

I. Acquisition and II. Catalog (Total)

Libraries	Professional	Library Assistant	Clerk	Student Assistant
A	12.94	19.00	54.29	13.76
B	15.04	20.37	45.53	19.06
C	11.68	3.80	41.16	43.36
D	12.44	17.58	49.38	20.60
E	16.76	18.24	41.52	23.48
F	15.28	16.41	41.98	26.33
G	3.45	36.08	38.98	21.49
H	22.48	5.92	51.64	19.95
I	8.72	20.92	37.76	32.60
J	9.77	29.45	35.29	25.49
K	19.47	8.00	46.36	26.17
L	22.25	13.70	44.38	19.67
M	9.44	17.48	33.58	39.50
N	22.91	23.51	23.27	30.31
O	11.42	20.58	45.56	22.45
P	6.87	9.54	46.98	34.61
Q	22.98	17.73	37.92	21.36
R	20.45	12.37	32.68	34.51
S	18.91	21.53	43.79	15.77

APPENDIX C

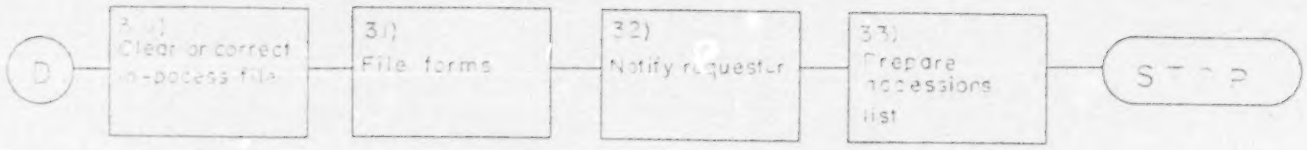
FLOWCHARTS OF ACTIVITIES

I. Acquisitions A. Preliminary Activities

I. Acquisitions B. Ordering

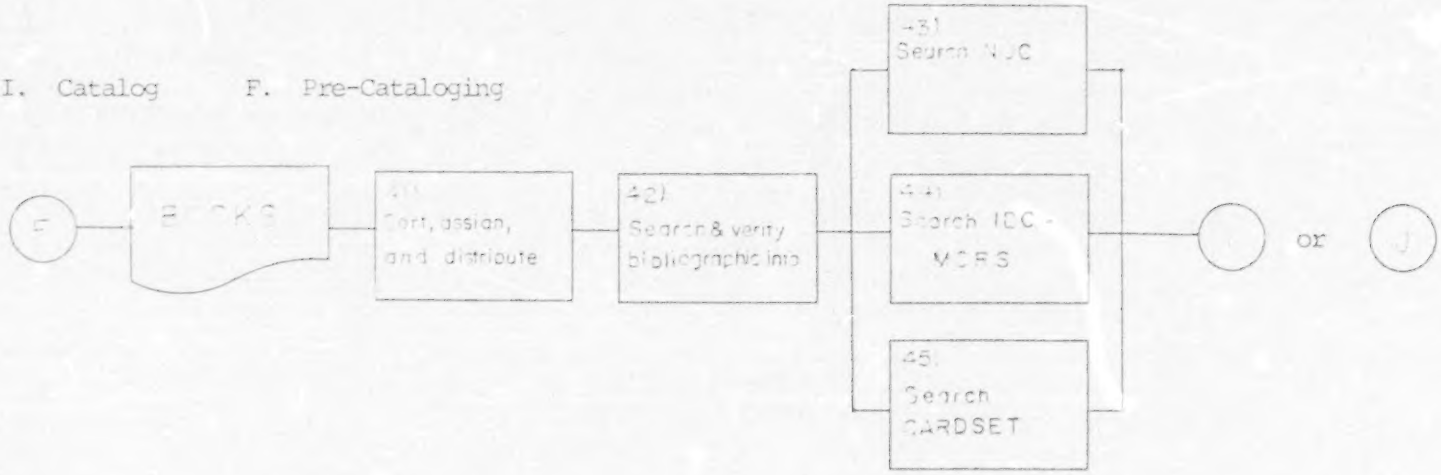
I. Acquisition C. Receiving

I. Acquisition D. Post-Cataloging



I. Acquisition E. Miscellaneous Activities

II. Catalog F. Pre-Cataloging

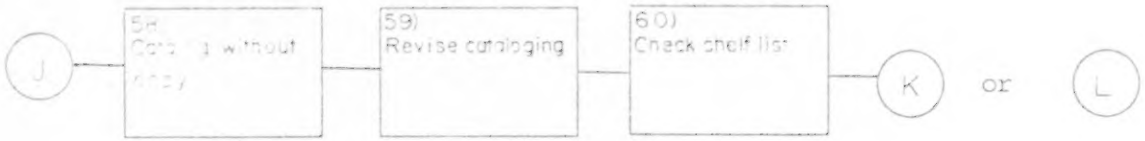


II. Catalog G. Obtaining and Maintaining LC Data

II. Catalog H. Added Copies/Added Volumes Routine

II. Catalog I. LC Cataloging (i.e., that performed with LC Copy)

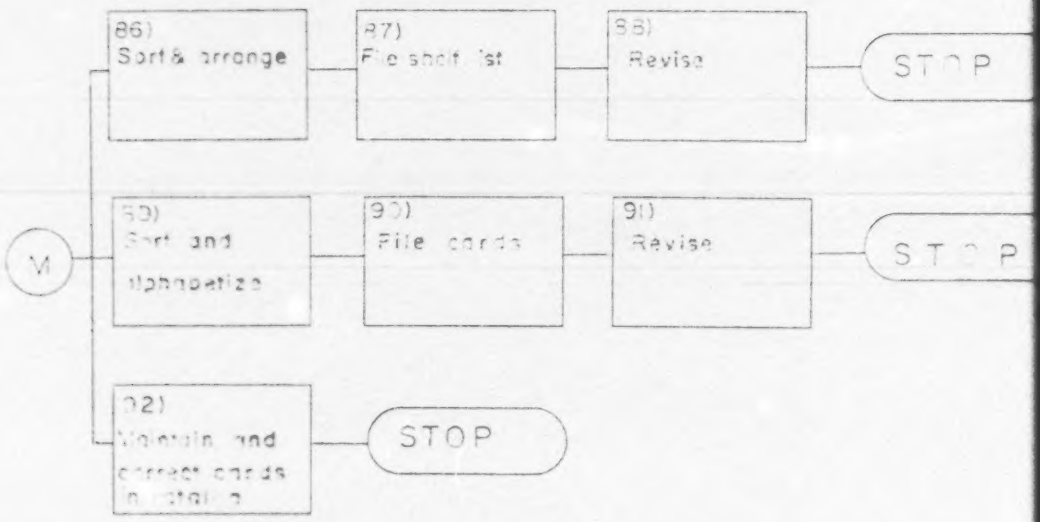
II. Catalog J. Original Cataloging (No LC Copy Available)



K
Card prepared by computer
6.2)
Type complete card sets
6.3)
Type master card
6.1)
Modify card or proof slip
6.4)
Revise master
6.5)
Reproduce card sets
6.6)
Sort cards into set
6.7)
Type call number added entries
6.8)
Revise card sets
7.1)
Prepare authority cards
7.1)
Prepare x-ref cards
M

II. Catalog L. End Processing

II. Catalog M. File Maintenance



APPENDIX D

TABLES

Table 1

Salary Averages ($/hr.)

Libraries	Professional	Library Assistant	Clerical	Student Assistant
A	5.11	3.62	2.96	1.96
B	5.45	3.98	2.86	1.83
C	4.83	3.20 L	2.82 L	1.91
D	5.37	3.83	2.88	1.24 L
E	4.99	3.76	2.91	2.07
F	5.19	3.80	2.90	1.78
G	5.20	3.90	3.08	1.93
H	5.55	4.19 H	3.09 H	1.80
I	4.64 L	3.85	2.82 L	1.96
J	5.37	3.90	3.06	1.71
K	5.05	3.64	2.86	1.84
L	5.08	3.66	2.88	1.85
M	5.43	3.75	2.99	2.08 H
N	5.34	4.08	3.04	2.00
O	5.46	3.89	2.90	1.76
P	5.76 H	3.87	2.94	1.90
Q	5.12	3.82	2.99	1.77
R	5.47	3.75	2.93	1.85
S	5.15	3.84	2.98	1.97
	$\bar{X}$ = 5.24	3.81	2.94	1.85
	SD = 0.2147	0.1337	0.0689	0.1158

Table 2

List of Activities Omitted

6								I		K										
742			C					I		K		M	N		P		R	S		
743			C	D				I				M	N				R			
744			C			G		I		K	L	M	N		P	Q	R			
745	A		C	D	E	G	H	I	J	K	L	M	N	O	P	Q	R	S		
11													N					S		
12													N							
15								I												
20	A				F								N		P					
22						G	H											S		
23											L				P					
25						G														
26											L									
29											L					Q		S		
31		B				G														
32						G												S		
33		B	C			G					L									
34		B		E		G				K	L					Q	R	S		
40							H										R			
44			C			G	H	I				M		O	P		R			
45	A	B		D		F	G	H		J		L	M	N	O	P	Q		S	
46							G					L								
47	A										K							S		
48																		S		
49			C	D		F			I	J								S		
50			C		E	F												S		
51			C			F	G		I		K						R	S		
53		B	C	D		F			I					N			Q	R		
55a			C																	
57		B					G					L						R	S	
59			C																	
60																	Q			
61		B	C			F			I	J		L					Q	R	S	
62	A																			
65			C															S		
67					E															
69																		S		
71					E						K									
72			C			F			I			L						R		
74				D																
77	A			D								M		O		Q	R			
79								H	I			L	M		O			R		
83								H											S	
85												L				Q	R			
88																		S		
91																		S		
93									I							Q		S		

Table 3

Correlation Coefficients of Unit Cost/Production Units

Process Requests	-0.20283	Original Cataloging	-0.38915
Titles Ordered	-0.42222	Total Cataloging	-0.03646
Total Ordering	-0.24741	Card Sets	-0.32197
Titles Received	-0.48834	Volumes Processed	-0.68476
Volumes Received	-0.36770	Total Processing	-0.34098
Volumes Added	-0.49640	Volumes Bound	-0.15574
LC Cataloging	-0.37152	Volumes Mended	-0.42913

Table 4

Correlation of Other Variables

Process Requests	-	Total Orders	0.97191
Volumes Received	-	Titles Received	0.88317
Total Cataloging	-	Original Catalog	0.96441
Total Processed	-	Card Sets	0.97732
Process Requests	-	Total Ordered	0.95390
Volumes Received	-	Volumes Bound	0.80810
Vols/Copies Added	-	Total Cataloged	0.86323
LC Catalog Vols.	-	Total Cataloged	0.82541
Card Sets	-	LC Cat. Volumes	0.91839
Card Sets	-	Original Catalog	0.85519
Volumes Processed	-	Total Processing	0.97115

Table 5

Libraries Ranked by Total Production Cost

Library Code	T.P.C. Total/$	Production Units	Unit Costs					
			LC	Orig.	Cat.	Vols. Proc.	Ord.	Proc.
1 G	11,409	36,038	.21 L	.47	.69	.20	.60	.64
2 C	14,767	22,154	.25	1.35	.68	.54	.97	1.07
3 S	16,454	28,113	.72	3.01	2.15	.28	1.28	.76
4 I	16,699	22,730	.56	3.74	1.38	.34	1.23	2.14
5 B	20,458	45,370	1.02	7.02	2.05	.45	1.77	1.85
6 E	23,309	38,976	.56	1.75	2.21	.27	1.23	.44
Median			.553	2.89	1.53	.35	1.18	1.15
1 H	29,306	62,569	.99	2.64	2.64	.27	.69	.87
2 A	29,541	126,421	.87	8.16	2.61	.41	.70	1.26
3 F	36,827	7,084	.80	3.08	2.59	.21	1.42	.73
4 D	42,768	68,529	.57	2.00	2.03	.40	1.10	1.44
5 N	43,017	62,081	1.95 H	1.89	2.76	.36	.63	1.07
6 O	47,712	79,455	.88	4.64	2.41	.36	.83	.96
7 Q	48,237	72,142	.73 *	2.98	2.15	.28	.78	.97
8 L	51,315	95,616	.86	3.42	1.81	.22	1.24	1.31
Median			.956	3.60	2.38	.31	.92	1.08
1 M	56,613	98,734	.73	2.86	1.90	.09	1.72	1.03
2 J	58,920	125,929	.75	3.85	2.02	.14	1.93	.49
3 R	64,633	62,826	1.36	2.04	2.58	.46	1.08	1.94
4 P	66,663	57,296	.55	1.95	1.86	.36	5.37	1.58
5 K	66,995	121,147	.25	5.67	.94	.12	1.97	.56
Median			.728	3.27	1.86	.23	2.41	1.12

Table 6

Percentage of LC and Original Cataloging and Total Labor Unit Cost

Libraries	LC	Original Cataloging	Total Unit Cost
A	90.25	9.75	11.52
B	95.30	4.70 L	12.03 H
C	93.39	6.61	3.77
D	61.22	38.78	5.61
E	88.33	11.67	5.23
F	86.24	13.76	7.00*
G	84.38	15.62	2.12 L
H	67.01	32.99	5.93
I	85.74	14.26	7.72
J	77.73	22.27	2.15
K	94.68	5.32	8.67
L	85.35	14.65	6.94
M	79.59	20.41	6.51
N	29.88	70.12 H	5.71
O	84.19	15.81	7.70
P	76.48	23.52	9.96
Q	80.16	19.84	5.78
R	74.93	25.07	6.75
S	91.95	8.05	6.97
Median	80.36%	19.64%	

L - Low
H - High
* - Median

Table 7

Median Labor Unit Cost

Processing Activities	$/Unit
Process Requests	0.52
Titles Ordered	0.56
Total Ordering	1.08
Titles Received	0.62
Volumes Received	0.39
Volumes Added	0.33
LC Catalog	0.73
Original Cataloging	2.98
Total Cataloging	4.4963
Card Sets	0.70
Volumes Processed	0.28
Total Processing	1.03
Volumes Bound	0.88
Volumes Mended	0.62

APPENDIX E

FIGURES

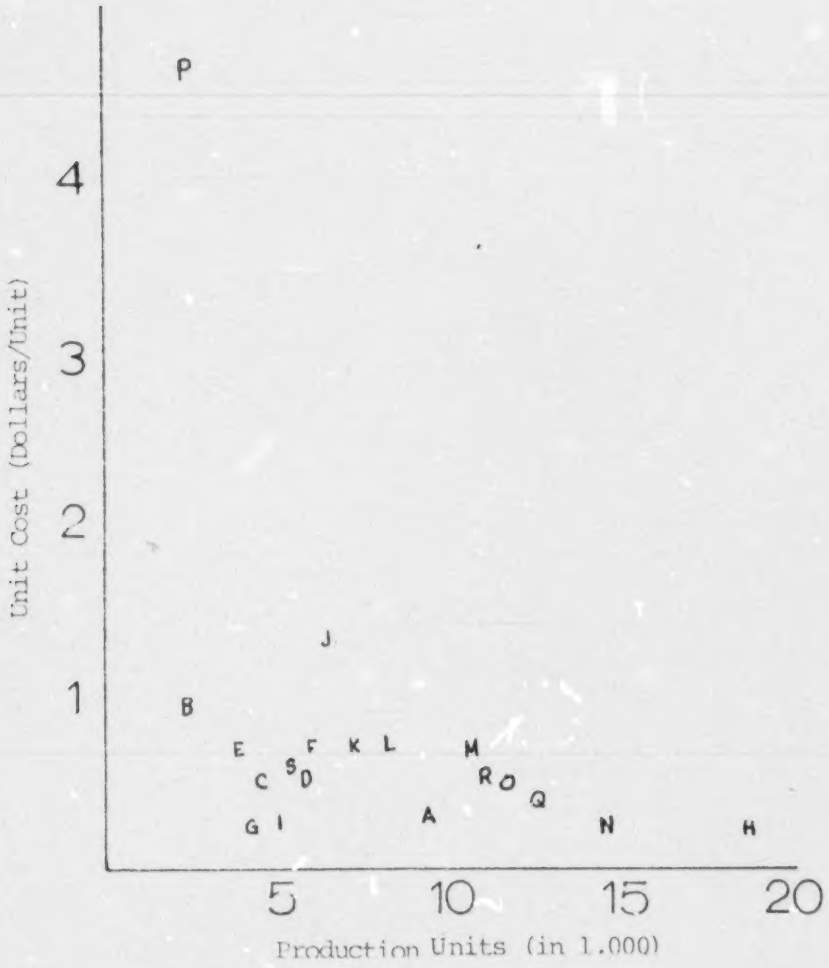


Figure 1

Process Requests

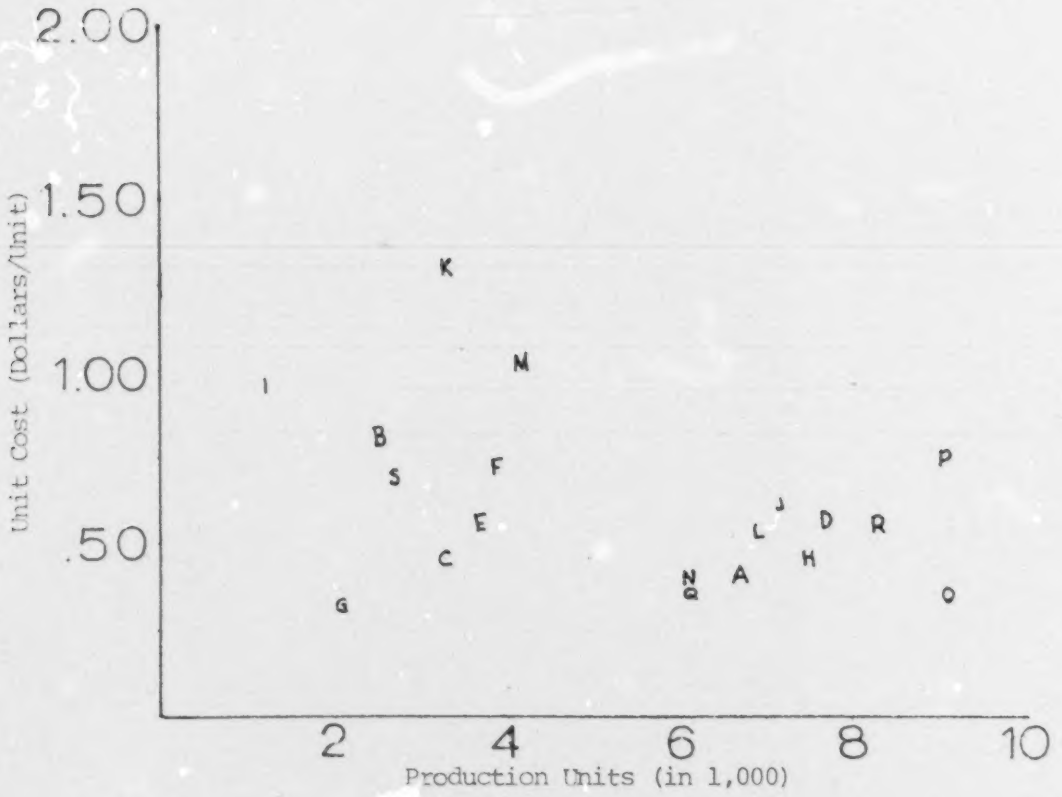


Figure 2

Titles Ordered

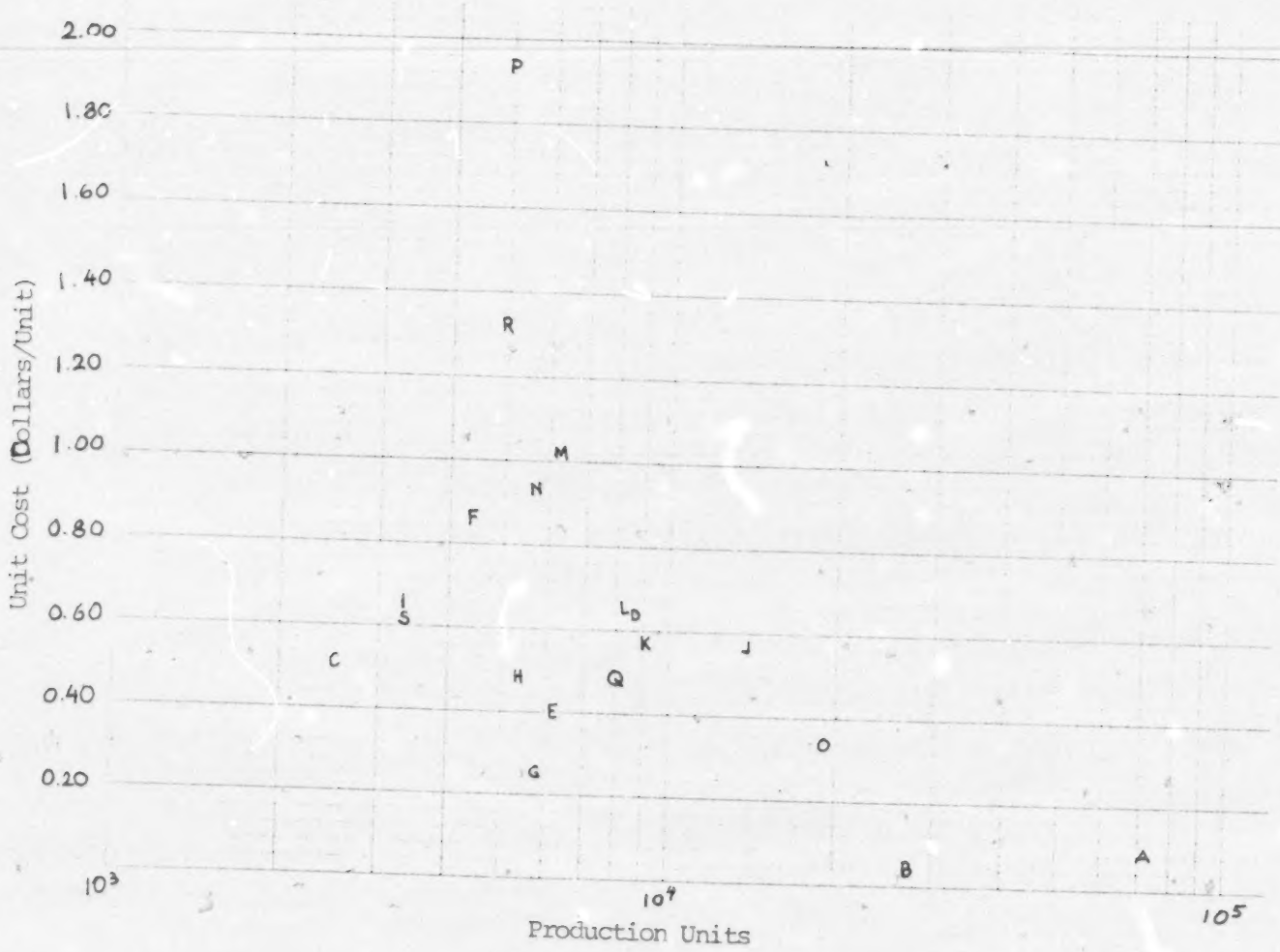


Figure 3

Titles Received

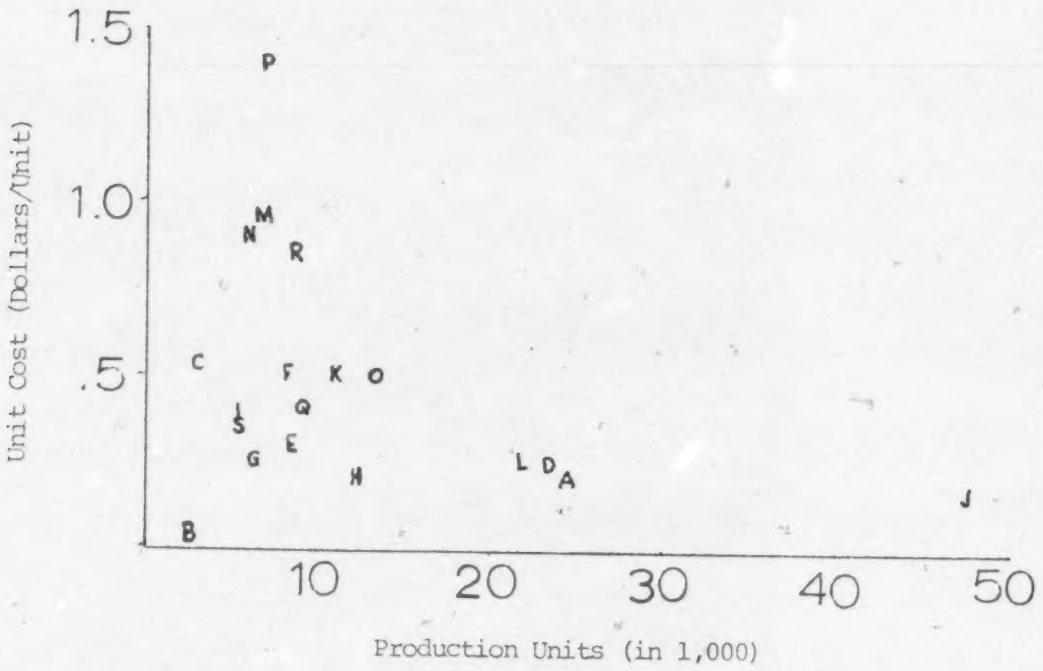


Figure 4

Volumes Received

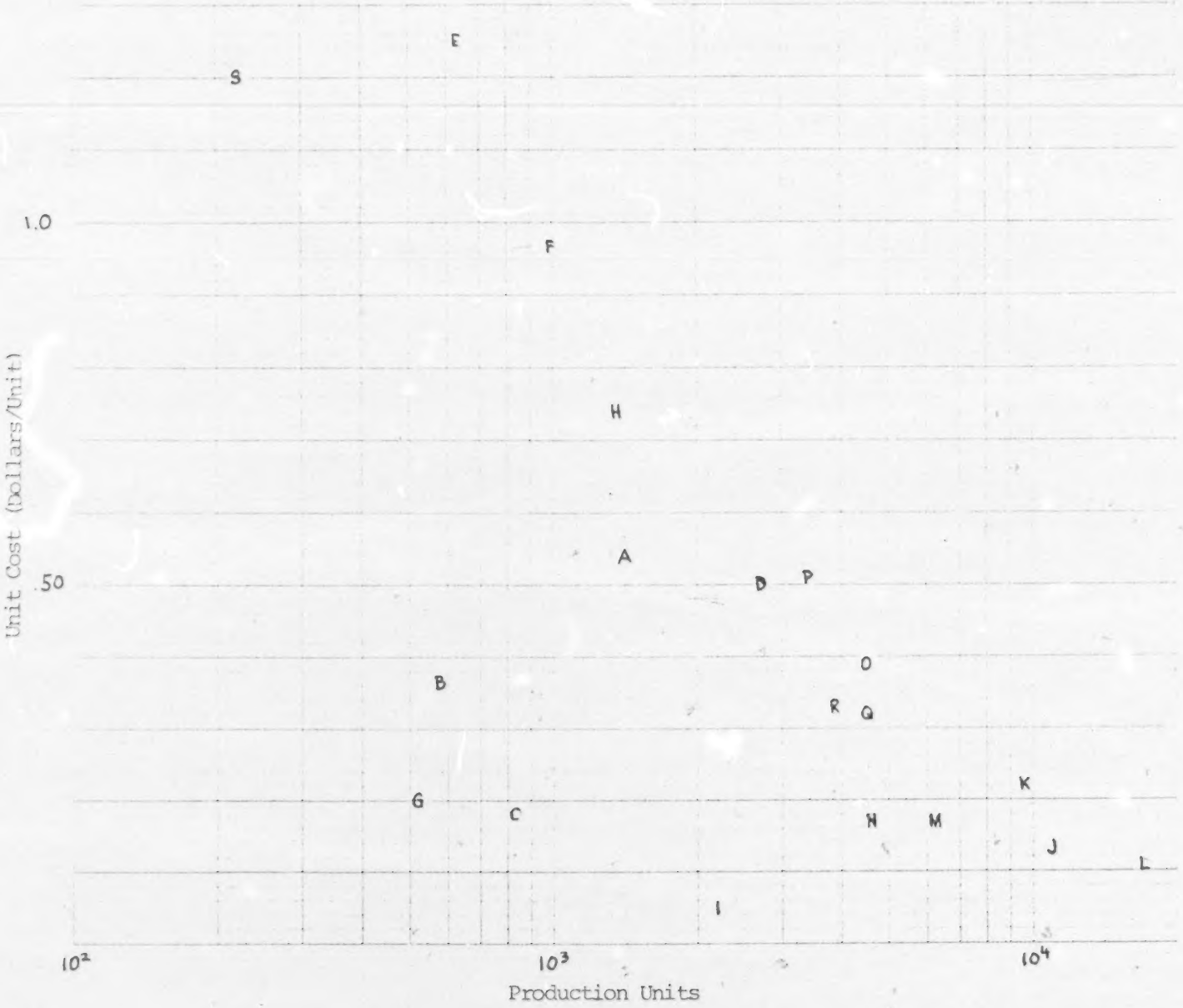

E
S
1.0
F
H
A
.50
D
P
O
B
R
Q
K
G
C
N
M
J
L
I
100
10^2
10^3
10^4
Production Units
Unit Cost (Dollars/Unit)
Volume Added

Figure 5

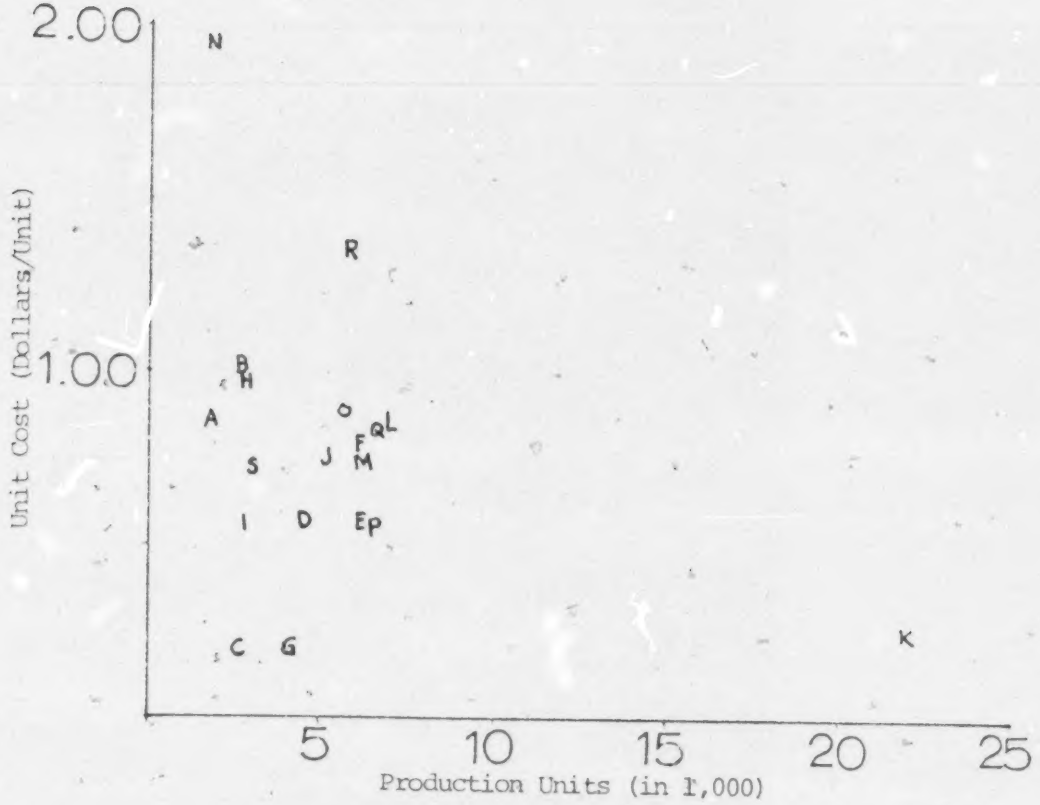


Figure 6

LC Cataloging

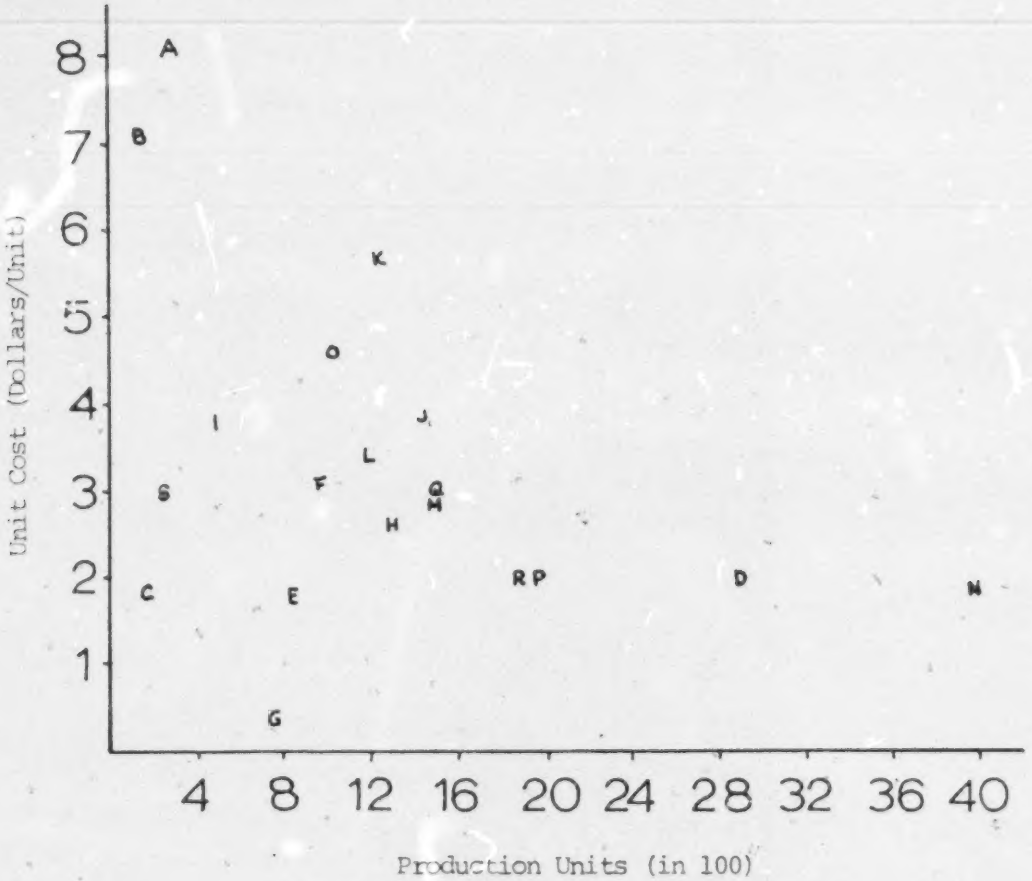


Figure 7

Original Cataloging

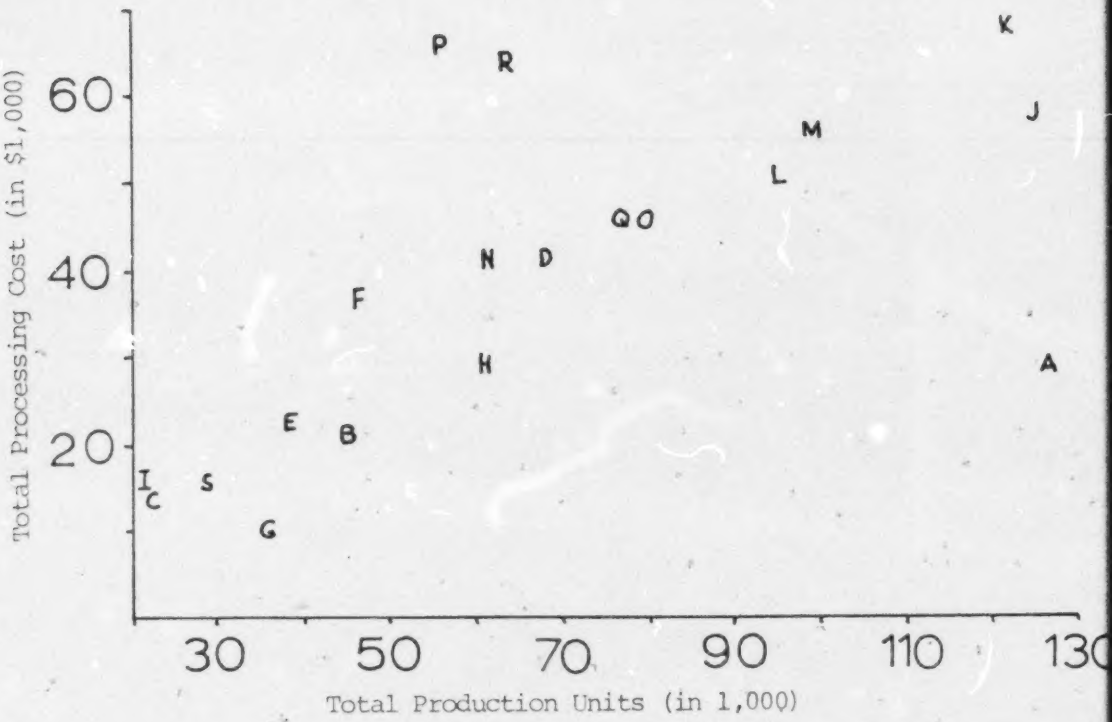


Figure 8

Total Production Units/Total Processing Cost

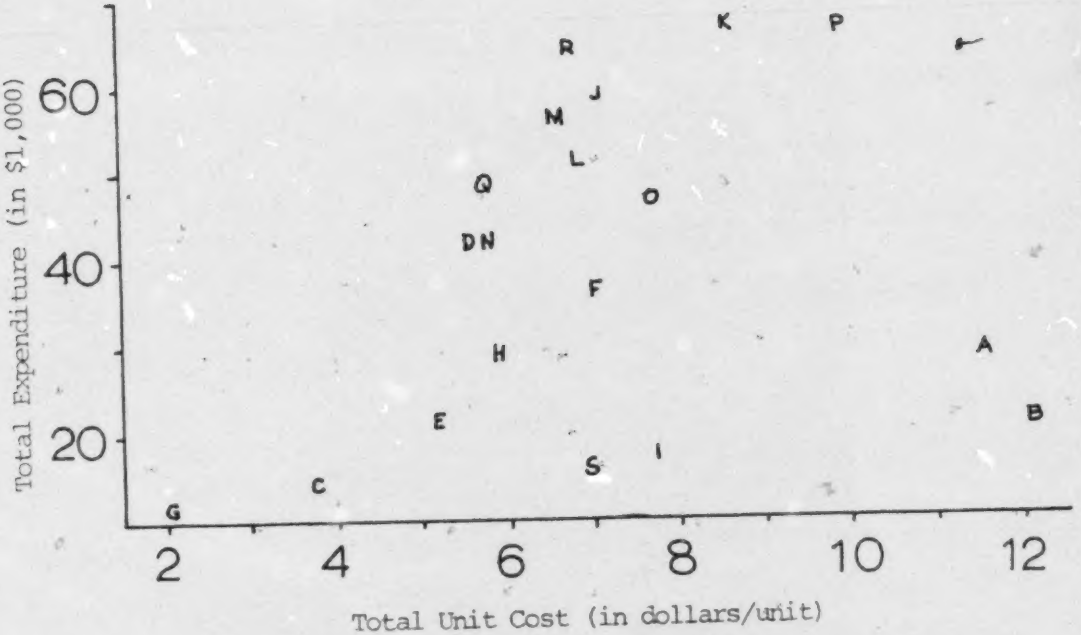
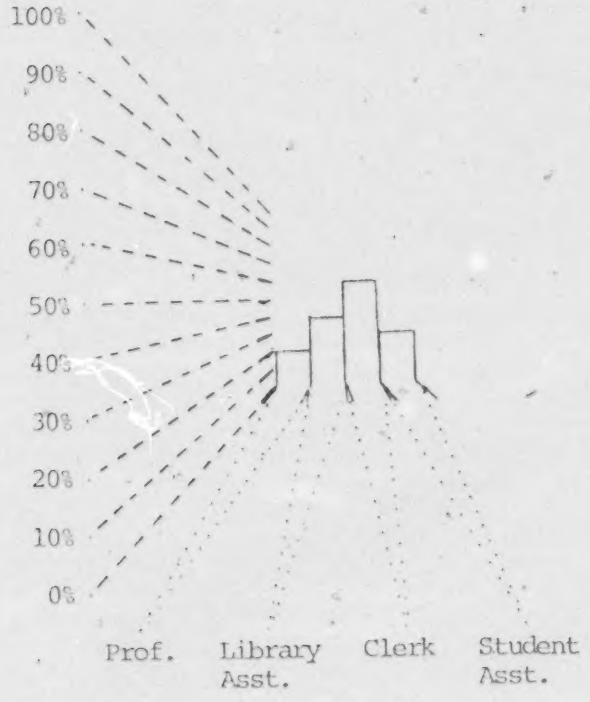


Figure 9

Total Unit Cost/Total Expenditure

Figures 10 through 15 are bar charts of the percentage of participation along the vertical coordinate and each column within a group of four representing professional, library assistant, clerical, and student assistant time. On the vertical scale one ince represents 100 percent with subdivisions in 1/10 inch intervals representing 10 percent. The more precise values are found in Appendix B.

LEGEND:



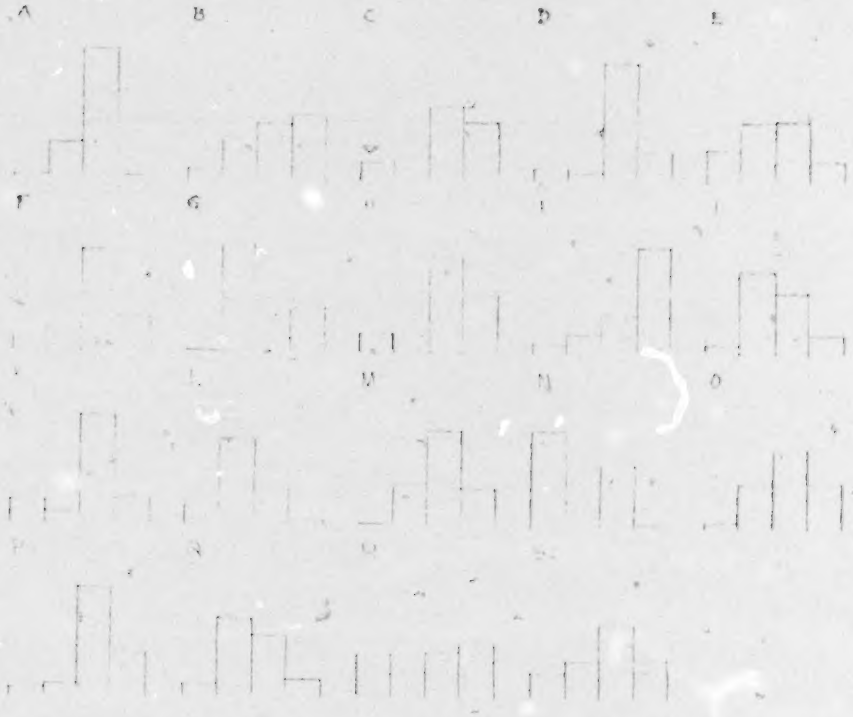


Figure 10

I. Acquisitions B. Ordering

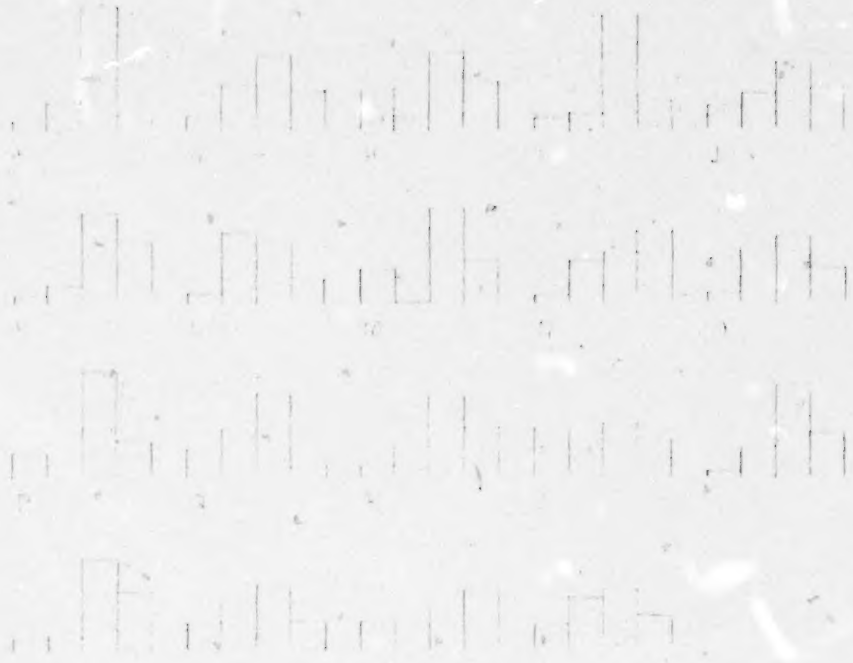


Figure 11

I. Acquisitions (Total)

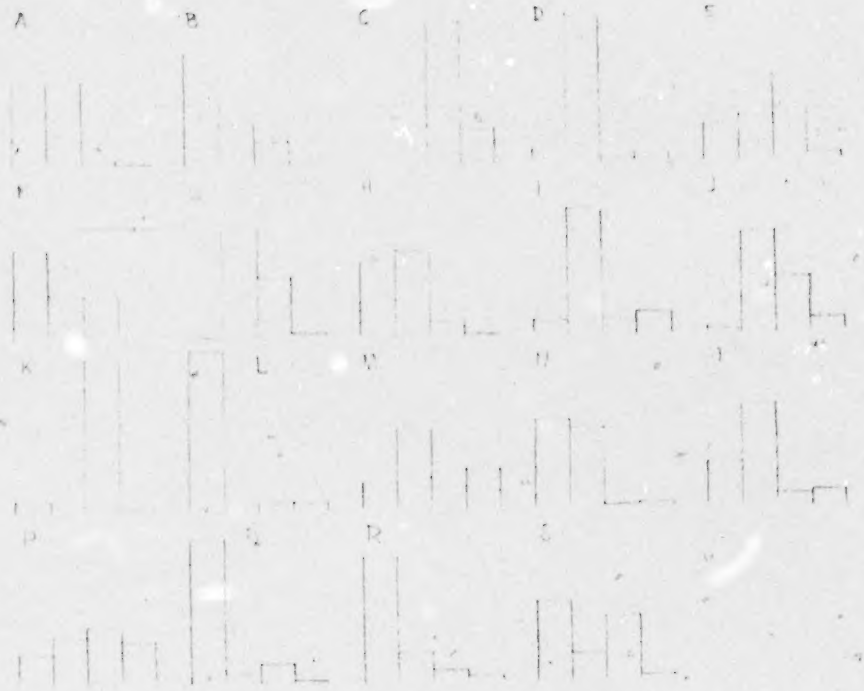


Figure 12

II. Cataloging I. LC Cataloging

Figure 13

II. Cataloging J. Original Cataloging

Figure 14

II. Cataloging (Total)

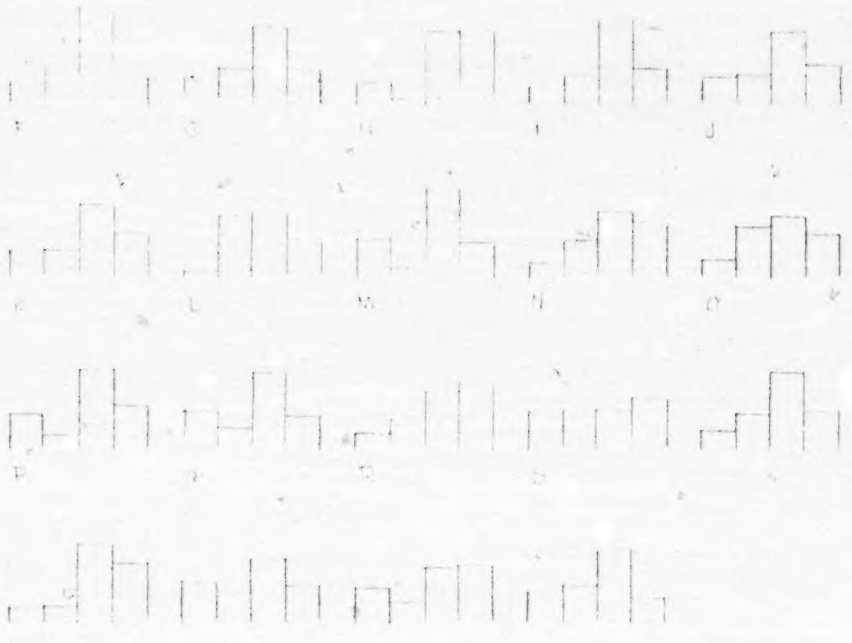


Figure 15

I. Acquisitions and II. Catalog (Total)

ACQUISITION

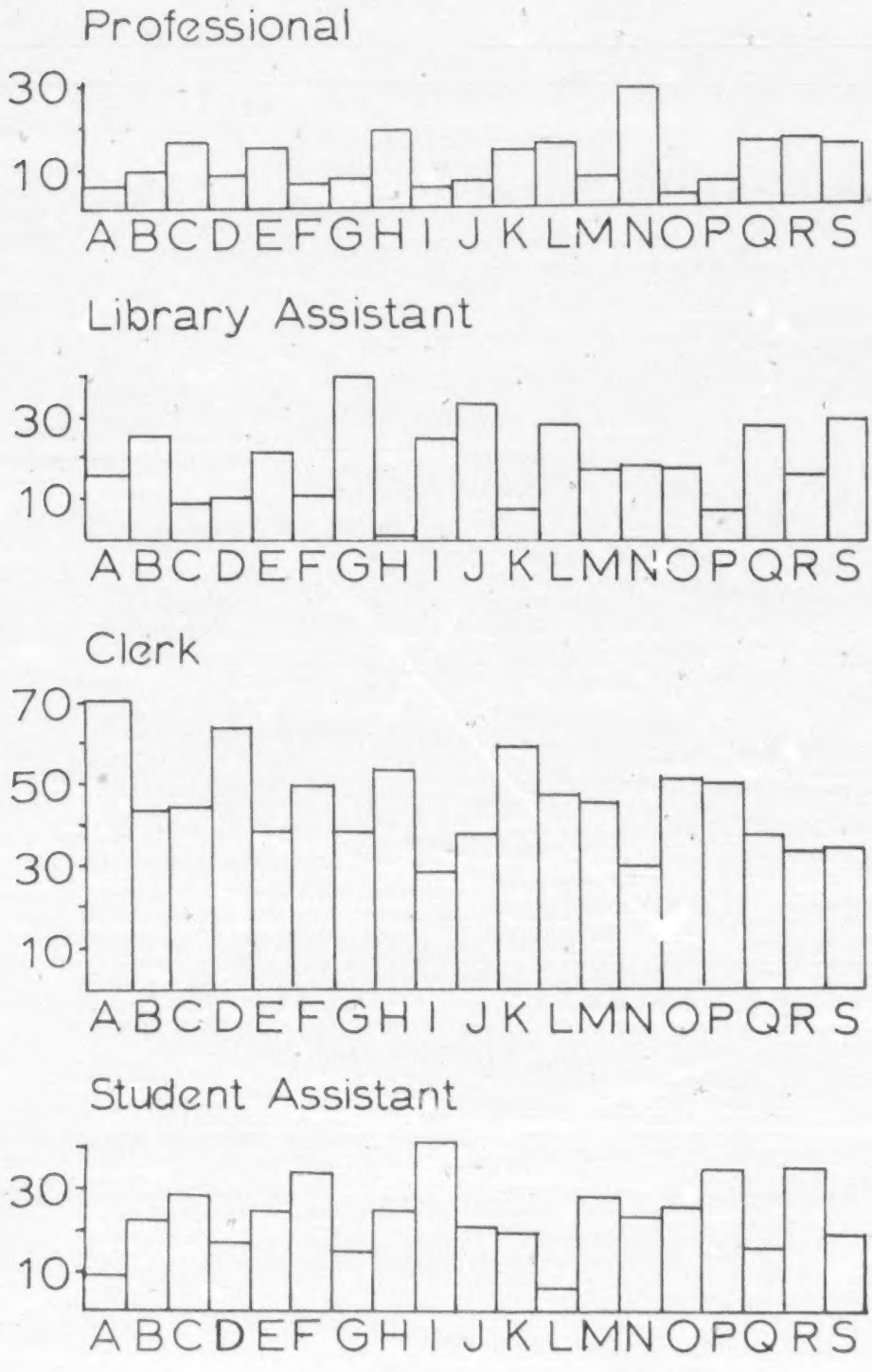

Professional
30
10
A B C D E F G H I J K L M N O P Q R S
Library Assistant
30
10
A B C D E F G H I J K L M N O P Q R S
Clerk
70
50
30
10
A B C D E F G H I J K L M N O P Q R S
Student Assistant
30
10
A B C D E F G H I J K L M N O P Q R S

Figure 16

CATALOGING

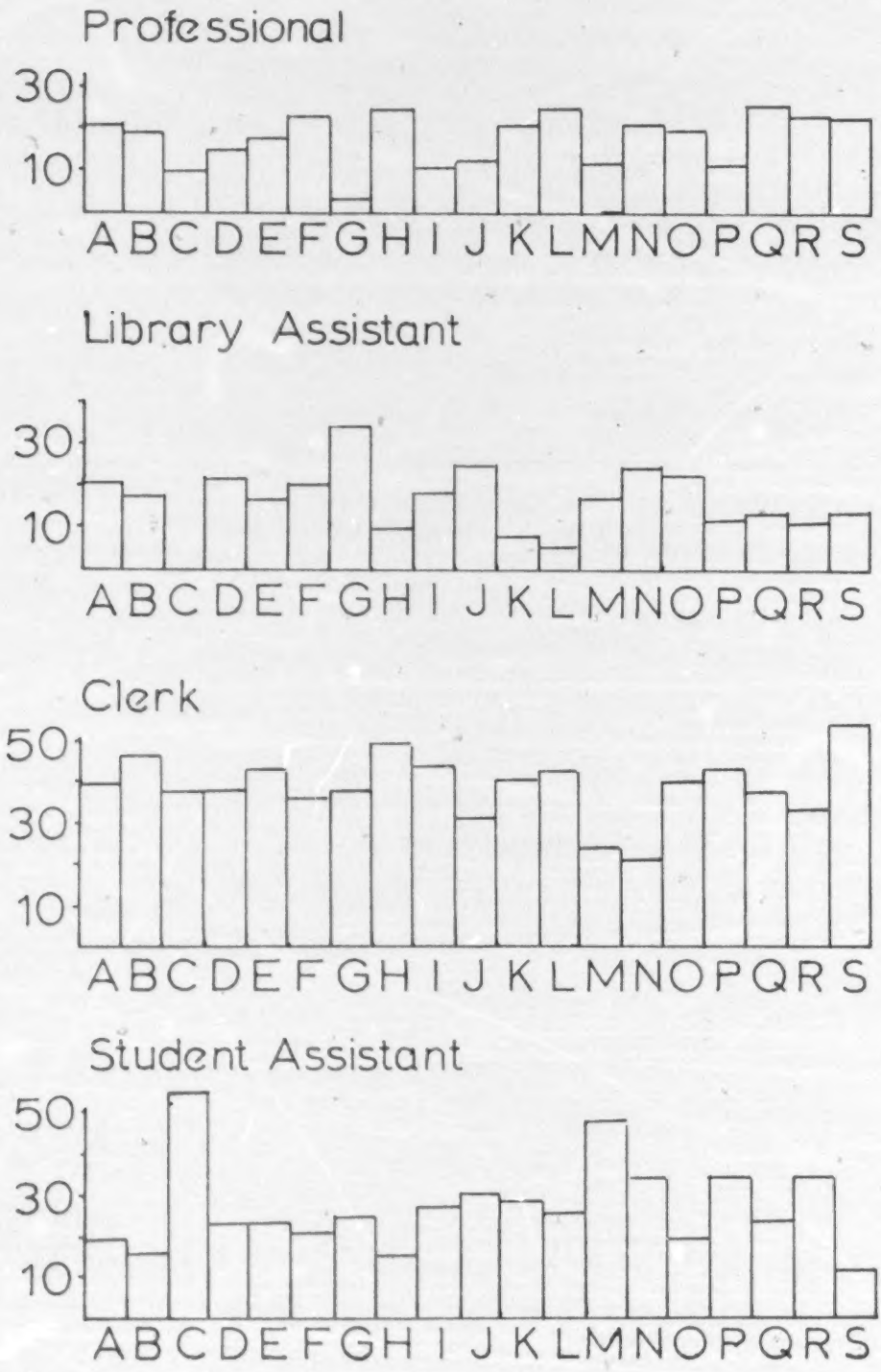

Professional
30
10
A B C D E F G H I J K L M N O P Q R S
Library Assistant
30
10
A B C D E F G H I J K L M N O P Q R S
Clerk
50
30
10
A B C D E F G H I J K L M N O P Q R S
Student Assistant
50
30
10
A B C D E F G H I J K L M N O P Q R S

Figure 17